ELECTRICAL REVIEW

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9th April, 1948

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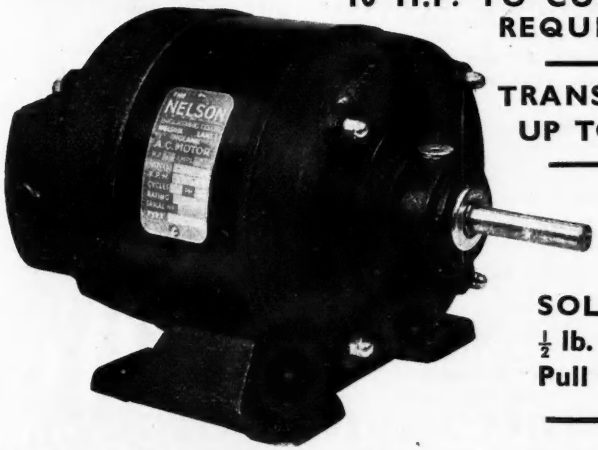

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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D.C. Possibilities

Some Economic Considerations

TRANSMISSION of electricity by direct current has always presented attractions, but its adoption on any appreciable scale has not hitherto been found commercially feasible. Nevertheless the margin between what might be and what can be lessens, and the latent possibilities for large projects have become the subject of closer investigation. Aspects of the present position as they appear to a Continental engineer are discussed by Mr. H. Giesbers on page 537 of this issue.

More obvious merits of d.c. are the absence of often complex mathematical relationships between current and voltage, the identity of kW with kVA and the ability to ascertain voltage drops without recourse to charts, which are necessary to avoid the labour of elaborate calculations with a.c. Of more real moment is the elimination of such troubles as may come from voltage rise, inductance, stability limits beyond 250 miles or so, and the incomplete use of conductor areas. Also, dielectric stresses and corona losses do not present the same problems.

Advantages of A.C.

Yet despite its drawbacks a.c. holds the field. In the first place large-scale generation calls for the use of alternators. Distribution as a.c. is likewise necessary on account of the flexibility permitted by transformers, the copper economy of three-phase four-wire networks and, not least, the unrivalled performance of the induction motor. Means of converting a.c. to d.c. and back again on the large scale requisite are the crux of the matter, both economically and technically. At the present stage they entail considerations of costs, physical dimensions, reliability and output per rectifier that more than offset, for distances now generally contemplated, the lower costs of the transmission line itself. Moreover, d.c. switching in any way comparable in operation with a.c. breaking at zero current has still to come.

Sweden's Decision

An implied commentary on the present position is to be found in the decision to use a.c. at 400 kV as the next step in transmission in Sweden, although the case for the adoption of the d.c. alternative there seemed stronger than it would have been in most cases elsewhere. Economic comparisons between the two systems are usually based on the cost of transmitting so many kW so many miles, but it may be that stress will come to be laid on distance rather than on kilowatts. In that event, among the early uses of d.c. might be the bringing of moderate quantities of electricity from such sources as the brown-coal field at Leigh Creek in South Australia to the consuming centre of Adelaide 360 miles away, instead of transporting fuel of low calorific value and high moisture content by rail.

Other determining conditions include those necessitating the use of insulated cables, which are not subject to technical limitations in regard to distance and are likely to prove a factor of great importance in drawing comparisons. An instance of

this is furnished by recent proposals to find an outlet for the hydro-electric resources of Tasmania on the Australian mainland by means of cables laid under the intervening shallow waters. Although the electricity supply layout in Great Britain offers little scope for d.c. transmission, in view of the potentialities abroad that are open to electrical manufacturers it seems desirable to begin field investigations here by operating a section of the grid on d.c. for experimental purposes.

Nationalization and Charges

It was perhaps rather injudicious of several chairmen of the newly-created Boards to stress in their eve-of-vesting-day statements that electricity charges would have to go up. It gave some of the more unscrupulous papers an opportunity of pointing out that nationalization and higher prices went together. We appreciate the chairmen's desire that the consumer shall not be misled by the more optimistic advocates of nationalization but we feel that they were a little too insistent on a less pleasant aspect of the situation.

Creative Evolution

Both Mr. Hacking and Sir Cyril Hurcomb emphasized the evolutionary nature of the new organization of electricity supply (see page 547) at the A.S.E.E. dinner last Friday. From the engineering angle this new organization will doubtless meet with general agreement. In some form or other the changes proposed would have come to pass sooner or later if further electrical progress was not to be hampered by an obsolete legislative framework, local Government boundaries and other factors irrelevant technically to modern supply requirements. In effect the opportunities provided by the grid to improve the efficiency of generation will be extended to distribution. By the use it makes of these further opportunities the B.E.A. will be judged. To reapply an old phrase, evolution must be truly creative.

In Factories

Public electricity supply, however, represents only part of the electrical industry, as Mr. Percy Good pointed out on the same occasion. While adequate recognition should be paid by the B.E.A. to the work of the Association in furthering the training of those supervising installation through the schemes mentioned by Mr. Nimmo, the A.S.E.E. has the no less important duty of ensuring that the plant provided by electrical manufacturers and installed by its members shall be efficiently operated and maintained in factories of all kinds. In this its more difficult task is to convince non-technical managements about the qualifications necessary in men on whom the running and more extensive electrification of the works plant ultimately depends.

Restrictive Practices

It is the aim of the new Monopoly (Inquiry and Control) Bill (see page 546) to protect the public against practices which restrict their access to goods and raise prices unduly. Whether that object will be secured by the proposals is questionable and another doubtful aspect is the definition of restrictive practices. Because manufacturers or sellers combine to regulate their industries it does not follow that they are working against the public interest. Responsibility for the success of the measure is thrown entirely upon the proposed Monopoly Commission on whose recommendations the Government Departments concerned will rely. It is not clear whether the Commission will be able to deal with complaints against the boards of nationalized industries, but at least there is no express exemption of these.

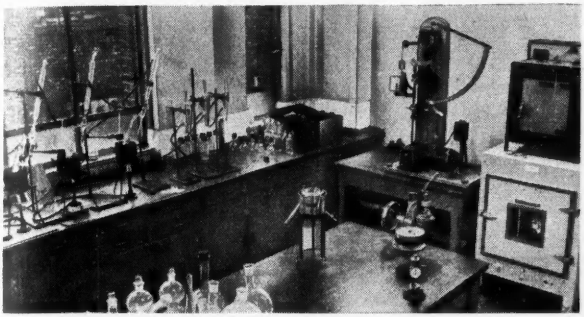
Electricity and Textiles

Two factors are mentioned in the Chancellor's Economic Survey as affecting Britain's export drive this year. One is the growing difficulty of selling some of our goods in certain overseas markets, and the other is the shortage of steel. The latter, more than anything else, it is stated, will limit production this year, and some shifting of the weight of the export spearhead to textile products is indicated. The targets for such goods are being raised and there is a considerable reduction in those of vehicles, machinery and other metal goods. In a report in 1946 a Textile Sub-Committee of E.D.A. showed that far greater electrification was essential if the cotton industry was to achieve maximum production, and the development of this industry, as of others, therefore depended on the availability of ample power supplies. It is consequently to be hoped that there will be no further cutting down of generating plant.

Resin Bonded Insulation

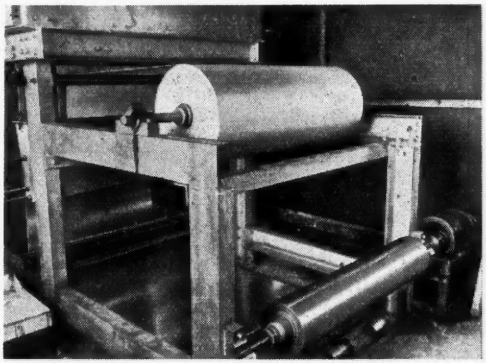
Manufacturing Processes: New Impregnation Plant

IN connection with the production of their various grades of synthetic resin-bonded "Ashlam" electrical insulation boards, Ashdowns, Ltd., have recently designed, constructed and put into commission at their factory at St. Helens, a new installation which represents the most modern technique in the impregnation of paper, cloth, etc., used in the manufacture of sheet electrical insulation. We recently visited the factory to see the processes generally employed and present another brief account of the production of "everyday" electrical equipment and materials.



Testing the raw materials gives effective control over the electrical properties of the products: pH meter, tensile machine and humidity oven in rear; viscosity, burst and thickness testing apparatus on central table

Generally, the development of synthetic resin insulating materials is regarded as a comparatively modern one and an outcome of the successful production of synthetic resin non-electrical mouldings of all descriptions. The roots of the development, however, can be traced back to 1890 when, in an effort to prevent paper from losing when wet its extremely good insulating properties, laminated paper board with shellac bonding was introduced. The success of this material was limited mainly by the fact that the softening point of shellac is about 60 deg C. With the advent later on of synthetic resins, by which a bonding material with a higher operating temperature (90 deg C) was obtainable, further success in the development was achieved, but it was not until a comprehensive research had been carried out in the 1920's that the underlying principles of the production of such insulating materials, embracing a direct relationship between factors governing the production of good quality insulation and the quality of the final product, were fully appreciated.



Dry paper is drawn through a trough of impregnating varnish before it passes into the drying chamber; feeding (raw) paper and delivered (impregnated) paper same side

Doubt still exists as to whether a thorough impregnation results from the resin being deposited actually in the fibre of the base insulating material, or whether the bonding merely surrounds the fibres, but whichever view is taken the fact remains that sheet insulation can now be produced consistently with both high electrical and mechanical

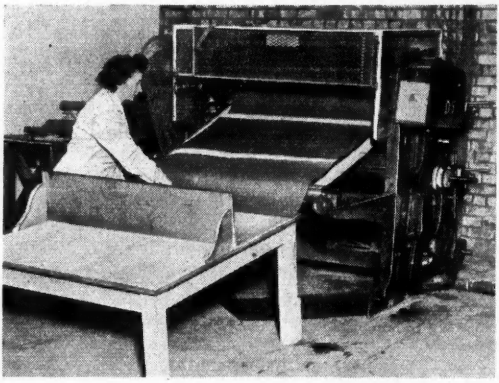
strengths and low water absorption points.

There are four main classes of the "Ashlam" materials, the first three having paper, cloth and asbestos base fillers, respectively, while all three are bonded with synthetic cresol-formaldehyde resin. The fourth material has a glass-cloth ("Fibreglass") base bonded with the new silicone resin. Of the paper-base class there are three grades, "P.W.," "P.E." and "P.X." The first grade has tensile, compression and shear strengths of 10,000, over 30,000 and 10,000 lb per sq in. (700, 2,100 and 700 kg per sq cm), respectively; electrical strength upwards of 25 kV along the laminae of a test piece one inch (25·4 mm) wide at 90 deg C; and a power factor of 0·08 at 50 cycles. The corresponding figures for the second grade are 15,000, over 30,000 and 12,000 lb per sq in. (1,050, 2,100 and 840 kg per sq cm); 30 kV; and 0·02 p.f. Similarly, the respective values for the third grade are 15,000, 12,000 and 10,000 lb per sq in.; 100 kV; and 0·01/0·02 p.f. The third grade also has an electrical strength across the laminae of 300 to 500 V per mil (0·025 mm).

There are also three grades of cloth-base material "F.F.," "F.M." and "F.C." Mechanical rather than electrical strength is the predominant requirement of these fabric materials, and the respective cross breaking strengths are 21,000, 18,000 and 17,000 lb per sq in. (1,470, 1,260 and 1,190 kg per sq cm). Both asbestos paper and asbestos fabric are employed as bases for the asbestos insulating boards, and the outstanding characteristic is the high temperatures at which they can be operated: up to 150 deg C for prolonged periods and up to 180 deg C for short periods.

The silicone glass-cloth insulating board is a new product which is to all intents and purposes fireproof and non-tracking, and has also high electrical and mechanical strengths and low water absorption values. It is suitable for continuous operation at 250 deg C, and it has a tensile strength of 16,000 to 17,000 lb per sq in. (1,120 to 1,190 kg per sq cm). It has an electrical strength in oil at 90 deg C of 300 to 500 V per mil and a power factor of 0·0098 at 50 cycles and at 20 deg C. All these grades of material can be subjected satisfactorily to all normal machining operations, and, with the exception of the glass-base material, the production processes to be described are common to all grades and classes.

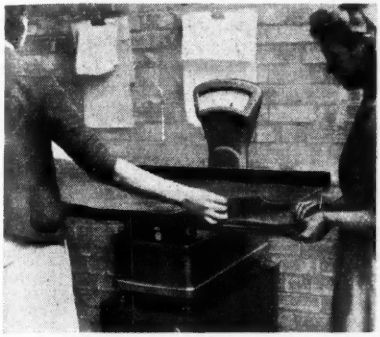
The four main raw materials—paper, cloth, solid resins and solvents—are all thoroughly tested before being put into the production line. The various grades of paper used are specially prepared for their purposes, the principal paper for electrical properties being pure sulphate kraft. The paper is received in rolls 42 in. (107 cm) wide and up to 6 mils (0·15 mm) thick, a roll averaging about 2½ cwt (126 kg). Each roll is subjected to a comprehensive range of tests which constitute some of the principal means of effecting a control over the electrical properties of the finished products. These tests include the following: Tensile, stretching and thickness; burst strength; porosity test and pH value, all to the standard Paper Makers' Association specifications. Three grades of cloth are used, a fine cambric with a weave in excess of 100 threads of warp and 100 of weft per inch, a second cloth with approximately 65 by 65 threads, and a third cloth with about 40 threads each way. The weave is checked on receipt, and the cloths are also tested for tensile strength and pH values. Most of the resins are received at the works in solid form and the highest importance is attached to testing them, again as a control over the ultimate electrical properties, curing time, moisture content and softening point being some of the more important tests.



Sheets of impregnated paper are cut by a machine with constant-speed feed rolls and an adjustable-speed revolving knife

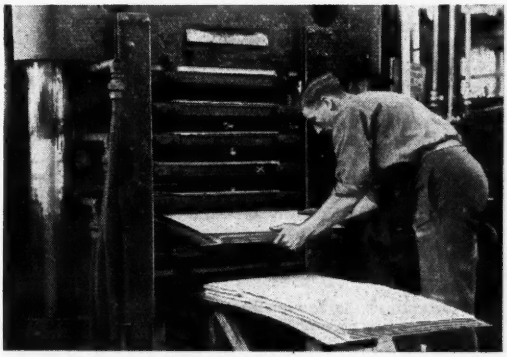
Care is also taken to see that no undesirable material is introduced by way of the solvents —mainly alcohol.

In the production line the first of the raw materials to be introduced (at the mixing machines) are the solid resins and the solvents.



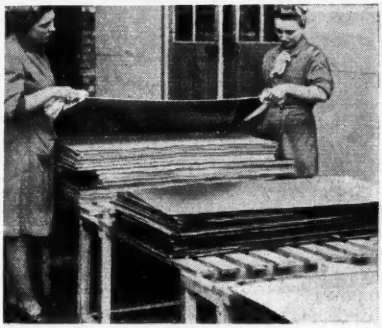
The operation in the machines reduces the resins to varnish. Before being pumped away to storage tanks at the impregnation plant the varnish is tested for viscosity, specific gravity, flash point and solids content —all most important tests with regard to the electrical properties of the product.

The varnish thus produced and the paper or cloth are then introduced at the new impregnation machine. The base material is fed from the roll, passed through a bath of the varnish and then into a tall vertical drying chamber. When it emerges from this, the resin is dry and the material may be wound on to rolls for storage until required. The speed of travel through the heating chamber, and the temperature at various stages are carefully controlled by recording graphs at the foot of the tower.



Curing takes place in a 500-ton hydraulic press with six "daylights"; press complete during loading

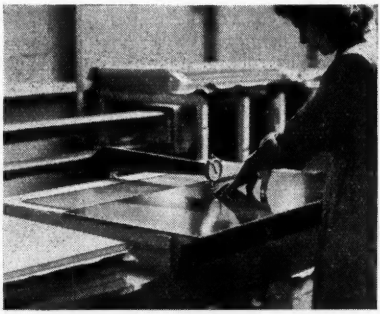
An over-riding control of the electrical properties of the product is effected at this stage by taking, at frequent intervals, test specimens of the impregnated material. These specimens are checked for the weight of resin deposited, the degree of precure, and the amount of volatile matter present, the variations permitted being within very close limits. The rolls of approved material are



Weighing (left) and stacking prepare the impregnated sheets for the curing press

stored in a temperature and humidity controlled room until they are required for pressing.

The next stage is to pass the rolls of impregnated material through a rotary cutting machine to produce sheets of the required size. These sheets are carefully assembled on a weighing machine by which the thickness of the stack (the requirement for a board) and hence of the final board is determined by the weight and not by the number of sheets. Each stack is placed between a pair of stainless-steel plates, highly polished or semi-ground, which impart the required finish to the board. One or more stacks, each with its plates, may constitute the load for a "daylight,"



Testing the boards for thickness

i.e., a space between a pair of heated platens on the curing press.

Pending the delivery of a new press, curing is being carried out on a 500-ton hydraulic press with six "daylights" producing boards 20 in. by 40 in. (51 by 102 cm) and 26 in. by 40 in. (66 by 102 cm), the period of the curing time depending on the thickness of the boards being pressed, i.e., the time required for the heat to penetrate to the centre of the loads. In the press an identification number is impressed on one corner of each board to enable the complete history of the board to be traced from the receipt of the raw materials. After a first inspection the cured boards are trimmed to size, and tested for thickness on a table equipped with a micrometer gauge. The mainly electrical testing laboratory for the finished products provides enough matter for a future article. After a final inspection, the approved products are ready for shipment.

We are indebted to Ashdowns, Ltd., for permission to visit the factory and to publish this article, and to Mr. E. R. Spurgeon, technical manager of the Laminated Department, for help in preparing this article.

Negotiating Machinery for Supply Industry

THE British Electricity Authority on 31st March concluded agreements establishing machinery for the settlement by negotiation of terms and conditions of employment of persons employed by the Central Authority and the Area Boards, with provision for arbitration in default of settlement of differences.

With regard to the manual workers, of whom there are 80,000, the machinery is in effect a continuation of that which has operated for the past thirty years, with adaptations to meet the change in ownership of the industry, and the contracting unions are the Amalgamated Engineering Union; Electrical Trades Union; National Union of Enginemen, Firemen, Mechanics and Electrical Workers; National Union of General and Municipal Workers; and the Transport and General Workers' Union.

As regards the technical staff, of whom there are about 10,000, the machinery also follows the existing pattern which has been established nearly thirty years. Only one union is concerned, namely, the Electrical Power Engineers' Association.

In the case of the administrative and clerical grades, there has been no machinery specifically designed to deal with that section of the industry. Consequently new conciliation machinery has been established under an agreement similar in terms to those relating to the manual workers and the technical staff. The contracting unions in this are the Clerical and Administrative Workers' Union; National Association of Local Government Officers; National Union of General and Municipal Workers; and the Transport and General Workers' Union.

In the case of the manual workers and the administrative and clerical grades, the conciliation machinery is of the "three-tier" type and provides for joint consultation at national, district and local levels. In the case of the technical staff, the machinery provides only for joint consultation at national and district levels, but the question of further extending the machinery to cover consultation at local level is being explored.

Hotel Lighting

AS part of the reconversion of the Grand Hotel, Scarborough, the British Thomson-Houston Co., Ltd., has installed modern fluorescent lighting. The lighting of the lounge represents an interesting departure from standard methods. A complete girdle of metal indirect lighting troughs formed on the balustrading around the edge of the balcony throws light on to the ceiling, the colour of which ensures that any "coldness" from the use of direct fluorescent lighting is eliminated, whilst a small proportion of the light from the troughs is used to give the whole balustrade a warm bronze glow. The balconies are lighted by indirect cornices, as also are the corridors on the ground floor. In the vestibule the lighting is carried outside the main doors by indirect lighting over the swing doors, silhouetting the main columns in the entrance. The main lighting of the ballroom is, as elsewhere, indirect, in this case emanating from the string course running right round the ballroom; in addition there are a number of wall fittings in each of which a "Mazda" fluorescent lamp is threaded vertically through a series of trumpet shaped cups.

D.C. Transmission

Estimated Comparative Costs

By H. Giesbers (*Consulting Engineer, The Hague*)

IN a paper presented before the C.I.G.R.E. in Paris in 1946 Dr. Ehrensperger estimated that the overall transmission costs (including capital charges, losses and maintenance) of transmitting 400 MW as a.c. and as d.c. at high voltage would be equal at about 250 miles (400 km) or, if a double circuit were used for a.c. and a single circuit for d.c., 125 miles (200 km).

These views are in close agreement with those expressed by the present author in No. 24 of *De Ingenieur*, 1946, on the basis of which the costs of transmission of 100 MW for 125 miles (200 km) by a.c. 150-kV overhead line and by d.c. underground 300-150-kV cable were compared. At pre-war prices the transmission costs worked out at 0·0405d. per kWh for a.c. and 0·04d. for d.c. A short distance was taken so as to get near the economical limit.

To represent present conditions, construction costs might be increased by 125 per cent, interest rate reduced by 1 per cent and production costs per kWh increased from 0·28d. to 0·45d. The change would be unfavourable to d.c., but it would just be remunerative. The cost of losses per kWh, being in direct proportion to the production cost, has gone up less than the construction cost of the transmission.

Before the war, transport of coal was very much cheaper than transmission of electricity. Now, with an increase in the cost of coal transport in Holland in a ratio of one to three and of electricity to a much lesser extent, the case for electrical transmission is considerably more favourable, although the latter is still more expensive.

Power from Mines

By transmitting 100,000 kW for 6,000 hours per annum direct from the mines to the load centre in the North-West of Holland the transport of about 360,000 tons of coal could be avoided, in addition to the saving of energy used by the railways and the advantage of relieving traffic congestion. Unfavourable cooling-water conditions at the mines would increase running charges for electricity, but with underground gasification it would become less expensive.

There is a general shortage of thermal power all over Western Europe, which is likely to continue for many years to come. More water power will be employed, which will have to be transmitted over long distances, and if a.c. is adopted there will be frequency and stabilizing difficulties. For example, the distance from the water-power stations in Sweden to the Ruhr is about 1,000 miles (1,600 km). The difficulties involved would be solved by the use of d.c. if this were technically and economically feasible.

On the other hand, experiments are being conducted in the United States with series capacitors (which give the effect of shorter lines), particularly in regard to protection against overvoltage on short-circuit. For the time being, a permanent earth return for d.c. lines could not be contemplated owing to the possibility of disturbances to communications, although the use of the sea seems more feasible.

Cost of D.C. Cables

With underground cables the economy of d.c. becomes even greater, since these cost about the same as d.c. overhead lines. A further advantage would come from the use of mass-impregnated cable if practicable. Swedish engineers have tested a cable of this type with a heating cycle; the cable, which was hung in a strap and reached a temperature of 158 deg F (70 deg C), broke down at 250 kV (36 kV per mm) at the highest point, from which impregnating compound had apparently migrated. The conclusion they came to was that mass-impregnated cable was unsuitable for this high direct voltage.

Nevertheless, tests on a 100-kV d.c. solid cable, which had operated without failure for eleven years in France on a route with steep gradients, showed that this type could now be made for 40 kV per mm with a sufficient safety factor. French cable engineers consider a solid cable for 2 × 600 kV feasible with dimensions not exceeding those of the 220-kV a.c. oil-filled cable installed in Paris.

The difference in these results would appear to be due to a surplus of impregnating

material in the first case and to high temperatures which would not occur in practice. The stress taken in the author's calculations was only 25 kV per mm. A mass-impregnated cable laid in Germany to carry 100,000 kW at 2 × 200 kV had an insulation thickness corresponding to about 29 kV per mm.

The hub of the problem, both technically and economically, is the rectifier, the cost of which is still an uncertain factor. Swedish engineers take a present price of 21s. per kW, whereas my calculations assumed 30s. as a pre-war figure. Since the rectifier equipment is at any rate expensive, this item will have less influence on the total cost, the longer the transmission; hence the economical minimum of transmission distance.

For producing the requisite high transmission voltage, series connection is necessary. Swiss and German opinion favours the circuit shown in Fig. 1 (a), and Swedish opinion that shown in Fig. 1 (b). The chances of backfire on both series connected tanks in (a) are less than on one tank in (b).

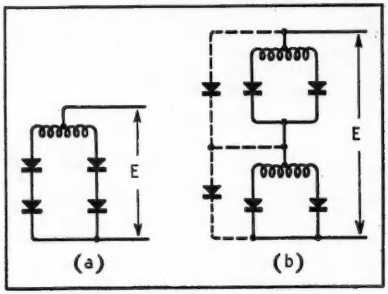


Fig. 1
(a) Series connection of rectifier tanks. (b) Series connection of rectifiers

In the former case, backfire neither reduces the direct voltage nor interrupts the supply, but it doubles the inverse voltage of the undisturbed tank, which has to be constructed to withstand this.

In the second arrangement, a backfire halves the direct voltage and a special bypass valve is needed to let the current pass; the inverse voltage is only a little above E, and Swedish designers believe that the probability of backfire can be diminished by constructing the tank on the large side. They are also of the opinion that a temporary reduction of voltage and the output by, for instance, 25 per cent for four rectifiers in series during, say, one second is unimportant. For dividing the potential evenly between anode and cathode, auxiliary grids with tapped resistances are used.

The inverse voltage has a very irregular wave form during half a cycle, with various peaks, and this wave form becomes more unfavourable still when the grids are used for the voltage regulation necessary in the reversed rectifier. Nevertheless, an inverse voltage of 130 kV and an anode current of 150 A is considered to give reliable results, which in itself is a remarkable achievement. By paralleling more anodes the current can be increased, and by series connection of rectifiers large outputs are obtainable. The development of d.c. circuit breakers for tapping off transmission lines is still in an elementary stage; the use of valves blocked by grids will be necessary.

The calculations mentioned in the beginning of this article have been made as an example only and it is obvious that there are neither economical nor technical reasons to adopt d.c. transmission in Holland in view of its short distances. There has been remarkable development in high-voltage rectifiers in the past few years, and the author believes that there is a field for d.c. transmission in other countries where greater distances are to be bridged or where power transmission across the sea makes a.c. transmission technically impossible, for instance, between Norway and Great Britain or between Tasmania and Australia.

380-kV Transmission

TO transmit the output of the 400,000-kW Harspranget power station under construction north of the Arctic Circle to Central Sweden 600 miles away, a 380-kV, three-phase line is to be built. In the *Anglo-Swedish Review* (January) Mr. W. Borgquist, director-general of the Swedish Water-power Board, states that the new line will have two conductors per phase, each with a steel core of 0·08 sq in. (0·52 sq cm) and an aluminium covering of 0·62 sq in. (4 sq cm). Both conductors will be suspended from a common insulator string and in the same horizontal plane 18 in. (46 cm) apart—which will raise transmission capacity by 32 per cent. Clearance between phases will be 40 ft (12·2 m) and span length 1,100 ft (335 m).

The capital cost is estimated at £8,000 per mile (£4,960 per km) and the total expenditure on the line and step-down transformer stations as equal to that of the generating plant which is given as £6 million, exclusive of land and water storage already covered in connection with the Porjus power station. At least six 380-kV lines are envisaged as the ultimate requirement.

Vesting Day Functions

B.E.A. Reception : "Farewell" Gatherings

BETWEEN three and four hundred people, representing all branches of the electrical industry and its organizations, as well as other departments of public life, gathered at the Savoy Hotel on 1st April to meet Lord Citrine and members of the British Electricity Authority upon the occasion of the vesting of the electricity supply industry in the new Authority.

Each guest was presented with a four-page brochure in which Lord Citrine gave a brief account of the steps which led up to the placing of the system under public ownership; details of the Central Authority and its chief officers; and a sketch of the Authority's proposals for co-ordinating the various units.

The function provided an excellent opportunity for the leaders of other branches of the electrical industry to meet and talk with the new "rulers" of the supply branch and it was undoubtedly a success.

At the B.E.A. reception. Left to right: Dame Caroline Haslett, Lord Citrine, Mr. F. T. Pepper (a miner from Tilmanstone Colliery, Kent) and Mr. Hugh Gaitskell, Minister of Fuel and Power

Employers' Organization

A LUNCH was held in London on 31st March by the National Electricity Employers' Organization upon the occasion of the final meetings under their present constitution of the National Joint Industrial Council for the Electricity Supply Industry, the National Joint Board of Employers and Members of Staff and the National Joint Committee of Local Authorities and Chief Electrical Engineers. Alderman Sir William Walker was in the chair, the principal guest being Lord Citrine.

Lord Citrine and his deputy chairmen, Mr. J. Hacking and Sir Henry Self

The toast of the Organization was proposed by MR. E. W. BUSSEY, member of the B.E.A., who gave a summary of the history of the organizations and their achievements, paying tribute to a number of pioneers. He stressed the importance of adherence to agreements by both sides and said that the success of the organization had been dependent upon the loyal observation of agreements throughout the history of electricity supply.

SIR WILLIAM WALKER, in responding, mentioned that he had been chairman of the National Joint Board since 1919 and said that it was impossible to see their organization being handed over without some feeling of regret. At least they were giving the new Authority an organization which had proved itself a real success.

The toast of "The Electricity Supply Industry" was proposed by MR. F. FOULKES, seconded by MR. F. LUMBY. The toast was supported by MR. E. A. NEWBURN who expressed the hope that engineers might still be encouraged to retain their individual outlook and exercise initiative; he believed that the B.E.A. would support this view.

Extracts from a letter which he had addressed to Lord Citrine were then read by Alderman Walker. In this he referred to the difficulties which had been overcome by the Joint Industrial Council and Board and mentioned that seven founder members of the joint organisations were present :—Lord Citrine, himself (Sir Wm. Walker), Mr. T. Cochrane, Mr. G. W. Essex, Mr. W. Arthur Jones, Mr. J. W. Thomas and Mr. A. H. Banks (secy.)

LORD CITRINE in replying to

the toast said that the new Authority aimed at maintaining continuity in management. He had been greatly impressed by the friendliness pervading the whole industry and he hoped that the B.E.A. would not be regarded as new owners but rather as trustees appointed by Parliament and the people. All the beneficial processes which already existed in the industry would, he hoped, be retained and guided into wider channels. He paid particular tribute to Alderman Sir William Walker and referred to the benefit derived from his long experience and valuable advice.

Employers' Organization Luncheon. Left to right: Mr. E. A. Newburn, Lord Citrine, Sir William Walker, Sir Henry Self, Mr. F. Lumby and Mr. E. W. Bussey

Board Chairmen's Statements

SPEAKING in Manchester last week, MR. GEORGE GIBSON, chairman of the North Western Electricity Board, said that in ordinary circumstances the Board would have wished the electricity supply industry's vesting day to have passed almost unnoticed. Unfortunately, however, one of the first duties of the Board would be to increase the price of electricity for domestic use. The Board took this step with regret, but the necessity for it had been foreseen by many existing undertakings and the prices would have been increased to domestic consumers even though the board had not taken over the undertaking. The Board was budgeting on the assumption that the domestic charge would have to be increased by at the most a farthing. The long-term policy of each Regional Board was to have a standard charge but that did not mean standard charges throughout the country. As the cost of generating electricity had gone up, it would be incumbent upon the Boards in most areas to raise the cost of domestic electricity.

He said that the Board was not taking over completely on vesting day, as it had entered into an agreement with the municipal authorities to act as agents until the Board was ready in about twelve months time to carry out its accountancy duties.

Helping Rural Consumers

MR. S. F. STEWARD, chairman of the South Western Electricity Board, speaking at a press conference at Bristol, said that it was obviously unfair that some people on the fringes of big towns should be paying 8d. per kWh for their electricity when others almost on the other side of the street were paying only ½d. National policy had still to be settled, but in general there would certainly be a "bringing together" of top rural and bottom urban tariffs to get as uniform a tariff as possible.

Mr. Steward, describing nationalization as "a tremendous adventure in organization," said the Board's job was not to pull down, but to build on existing foundations. Isolated farms needing miles of overhead lines would obviously provide special problems so far as the economic running of the service was concerned, but rural consumers would benefit greatly. Of 35,000 farms and holdings in the South-Western Area, only about 20 per cent had a supply of electricity, and only 8 per cent were using it for purposes other than lighting.

Domestic Electricity Charges

MR. J. S. PICKLES, chairman of the South-West Scotland Electricity Board, was the principal speaker at a vesting day luncheon given by the Board at the Central Station Hotel, Glasgow. Mr. Pickles said it might be that an increase in electricity prices was due and in some cases overdue. Electricity was being sold at pre-war prices to domestic consumers and in some cases even below. During the war, helped by considerable output and the use of recources, prices were virtually pegged and they had remained so. But economic factors could not be overlooked indefinitely. Many undertakings would have already put up the prices but for the approach of nationalization. No decision had yet been made by his Board to put up the prices, but adjustment would be made if it were absolutely necessary.

SIR NORMAN DUKE, chairman of the South-East Scotland Electricity Board, speaking at a luncheon in Edinburgh on 2nd April, said it might be necessary, in the near future, to increase the prices paid by domestic consumers in some parts of the area, but the Board had not yet considered the matter and did not

intend to jump to any hasty conclusions. They wanted to supply as much electricity as possible at the lowest possible economic price.

The chairman of the East Midlands Electricity Board, MR. C. R. KING, with other members of the Board, met the sub-area managers and district managers of the area at a gathering at the Victoria Station Hotel, Nottingham, on 1st April and outlined his plans. Offices of the Board are temporarily at 1, Derby Road, Ilkeston, but it is understood that negotiations are in progress to establish headquarters at Mapperley Hall, Nottingham.

London J.E.A.

MR. HERBERT MORRISON, Lord President of the Council, was the principal guest at the valedictory luncheon of the London and Home Counties Joint Electricity Authority on 31st March. In replying to the toast of "His Majesty's Ministers" proposed by the chairman, Mr. Morrison said that he supposed his presence was appropriate, for he had opposed the formation of the Authority and was a member of the Government responsible for its death. He had been in favour of the London County Council's taking over electricity supply in the County of London. In his view the constitution of the J.E.A. was all wrong and everything favoured conflict of interests; yet the arrangement had worked very successfully.

Mr. Morrison claimed that he and the Prime Minister (a founder member of the Authority) were the only members of the Cabinet who knew anything about the economics of electricity. He (the speaker) was indebted to that public-spirited electrical engineer of Hackney, the late L. L. Robinson, for his grounding in the subject. The new organization of the electricity supply industry was necessary; the new Boards would have to see that rural dwellers had electrical service at favourable cost and all consumers prompt attention when they were in difficulties.

The toast of "The London and South-Eastern Electricity Boards" was proposed by ALDERMAN I. J. HAYWARD (chairman, Finance Committee) and MESSRS. H. J. RANDALL and NORMAN ELLIOTT, chairmen of the respective Boards, responded.

Provincial Companies

THE Provincial Electric Supply Association held its twenty-seventh and final annual general meeting at the Savoy Hotel on 31st March. At a luncheon which preceded it MR. SELWYN S. GRANT, the chairman of the Association, welcomed a number of guests including Sir John Kennedy and Mr. A. E. Marson of the Electricity Commission, Sir Johnstone Wright and Mr. J. Hacking of the Central Electricity Board, Mr. H. F. Carpenter, chairman of the British Electrical Development Association and secretary of the British Electricity Authority, Sir Edwin Herbert, Mr. Arthur Collins, Mr. McKerrell (Power Companies' Association), and Mr. Harvey.

SIR JOHN KENNEDY said that none should feel sad at the occasion. They must recognize that changes must come and as they knew that the industry was going to be controlled by the same people they could rest in complete confidence that the industry would carry on and give the best service to the country.

At the annual general meeting Mr. Selwyn Grant paid a tribute to the work of Sir Harry Renwick, the Association's first chairman. When finance was very difficult to obtain he showed the way and established the County of London Electric Supply Co.'s power station at Barking which was still to-day the largest station in Europe. Mr. Selwyn Grant also paid a tribute to Sir John Dalton for nearly twenty years secretary of the Association.

During the thirty years of its existence the Association had had a membership of approximately one hundred companies. Much of its work had been in connection with legislation relating to the electricity supply industry, and it had also taken a prominent part in dealing with such subjects as rating, income tax allowances, standardization of electrical equipment and general practice.

B.B.C. Questions

LORD CITRINE, Dame Caroline Haslett, member, B.E.A., Mr. Eccles, chairman of the Merseyside and N. Wales Electricity Board, and Mr. F. Foulkes, president of the E.T.U., answered questions about the new public service in a broadcast on 1st April. They were interviewed by Mr. George Darling, B.B.C. Industrial Correspondent in the programme "Questions of the Hour—Vesting Day for the Electricity Services." LORD CITRINE said that if they paid no regard to the present national situation they undoubtedly would raise prices. A rough estimate of total increases in costs in the last six months alone was that they would add about £12 million a year to the cost of electricity, of which about £4 million might be recovered under agreements with industrial consumers. They were now able to view the industry as a whole, and it would be some months before they knew exactly what the position was. They wanted to avoid an all-round increase if they could and they might decide that for a time they would carry the losses which they inherited but they could not be expected to go on indefinitely losing money.

After MR. ECCLES had spoken on the construction of new generating plant, DAME CAROLINE HASLETT said that the provision of labour saving devices and all electrical equipment within the means of every domestic consumer was definitely one of the aims of the Authority. MR. FOULKES told listeners that he knew of no other industry in which better relations existed between work-people and employers.

Views on the News

Reflections on Current Topics

AT last week's luncheon of the London J.E.A. Mr. Herbert Morrison paid a well-deserved tribute to the memory of the late Mr. L. L. Robinson, the Hackney borough electrical engineer, who did so much to spread the benefits of electricity in that London area. Mr. Morrison said that Robinson was his instructor in the economics of electricity supply and that Mr. Attlee served a similar apprenticeship at Stepney. The two Ministers are thus able to lay down the law to their Cabinet colleagues in matters affecting the electricity supply industry.

* * *

By a confusion of initials some of the daily papers last week included Mr. John Mould (of Leicester), deputy-chairman of the East Midlands Electricity Board, in a list of new King's Counsel. Actually it was his brother, Mr. James Mould, who is "taking silk." I am indebted to Mr. C. T. Melling (chairman, Eastern Electricity Board) for a suggestion, made in conversation at last week's B.E.A. reception, that there is a definite connection between silk and Leicester.

* * *

From the office of the controller of the Merseyside and North Wales Division of the B.E.A. comes the first "house" journal to be produced for the new electricity authorities. It is called "The Gridiron" and contains a map of the Area, a picture of the Area headquarters, a message from the controller, Mr. A. R. Cooper and illustrated articles on "The Path to Nationalization" and "Looking Forward." It is a nice little production but it carries with it a somewhat alarming implication. Do all the fourteen Divisions and the fourteen Electricity Boards, and perhaps the British Electricity Authority intend to issue such periodicals ?

* * *

Close upon the heels of this magazine comes another, from the South Eastern Board. In this case I think that it is to a large extent the London J.E.A.'s "Bus-Bar" in new guise for most of the matter relates to activities which were formerly the concern of the J.E.A. There is, however, also an article on the Brighton undertaking; a message from the chairman, Mr. Norman Elliott; and a "Who's Who" of the Board and its principal officers. The journal is known as the "Sea Board."

* * *

A reference in the C.E.B. Report to possibilities of load shedding during the summer overhaul of plant, coupled with an increasing national load factor, raises the question of what is the true cost of supplying high-load-factor consumers. Dividing capital and administrative charges by the maximum kW demanded by an individual factory whose load factor approaches 100 per cent does not, it seems to me, give the correct primary charge for the tariff. A greater proportion of spare plant is needed than for consumers with intermittent or seasonal peaks which allow repairs and overhauls to be carried out at times of light load.

* * *

Hailing it as "a new American device," the *Evening Standard* describes an appliance for instantaneous water heating. "It is an aluminium cylinder 3½ in. by 2 in., attached to the tap nozzle by a thumbscrew. There is a flex to plug into the electricity supply. You turn on the water, the device gets hot, and so does the water running through it." I doubt the novelty of this "invention," for I seem to remember a similar thing which had a brief inglorious career in this country. If the device should be reintroduced here I suggest that a useful accessory would be a copy of the *Electrical Review's* instructions for dealing with cases of electric shock.

* * *

Running through the March *Proceedings* of the (American) Institute of Radio Engineers, I was pulled up by the words *Electrical Review* and found that they occurred in a reference to a paper on "The Theory of Wireless Telegraphy" by John Stone Stone published in 1904. Reading on, I found that the paper had been re-published "through the co-operative permission of the McGraw-Hill Publishing Company, which acquired ownership of the *Electrical Review*." At that time (1904) there was evidently an American journal of the same title. In case any other readers are puzzled by the reference, I can assure them that *this Electrical Review* remains in British hands.

—REFLECTOR.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Secretary of State for Scotland and the Minister of Fuel and Power have appointed Lord **Provost Powrie** of Dundee, and **Mr. J. M. Erskine,** general manager of the Commercial Bank of Scotland, to be additional members of the North of Scotland Hydro-Electric Board. Under the Electricity Act, 1947, the Board becomes from 1st April solely responsible for the generation and distribution of electricity in the North of Scotland District which is enlarged to include the city of Dundee, the county of Kinross and the parts of the counties of Angus and Perth now outside it. In view of their increased duties and responsibilities the membership of the Board is increased under the Act of 1947 from five members to not more than nine members.

Mr. Harry Towers, who has been director and general manager of A. Reyrolle & Co., Ltd., since the beginning of 1947, has been appointed managing director of the company. Before joining Reyrolle's Mr. Towers had been with Edmundsons Electricity Corporation, Ltd., since 1933, first as commercial manager and from 1939 as general manager and a director of the associated and subsidiary companies. He served as a member of the C.E.B. National Consultative Committee and he was also a member of the Government Committee set up to investigate and report on management. Before 1933 he was with Dorman, Long & Co., Ltd., at the company's head office at Middlesbrough.

Mr. H. Richardson, A.M.I.E.E., hitherto London branch manager, has been appointed sales manager of Bull Motors (E. R. & F. Turner, Ltd.), Ipswich. Mr. Richardson joined the company eleven years ago as sales engineer and was appointed London branch manager in 1940. His early training was carried out at Electromotors, Ltd., and at the Manchester College of Technology, following which he served for eight years as sales engineer with the General Electric Co., Ltd., before joining Bull Motors. **Mr. A. L. M. Bainton** has been appointed assistant sales manager at Ipswich and **Mr. R. C. Dawson,** at present sales engineer at the company's London office, has been appointed London branch manager.

Mr. H. Richardson

Lt. Col. Lord Dudley Gordon, D.S.O., has accepted an invitation to serve as president of the British Refrigeration Association for 1948. The vice-presidents are Sir Samuel R. Beale, K.B.E., Mr. K. Lightfoot, O.B.E., and Mr. A. M. Allan.

Mr. H. G. Sale, M.I.E.E., who joined the Bombay office of W. T. Henley's Telegraph Works Co., Ltd., in 1919, and was appointed manager for India in 1940, is retiring, and expects to leave for England early in April. **Mr. F. H. Pilcher,** who takes over control of the company's branches in India, Pakistan, etc., as from 1st April, commenced with Henley's in 1912. He was originally a member of the head office staff, but went to India in 1924.

Mr. F. H. Pilcher

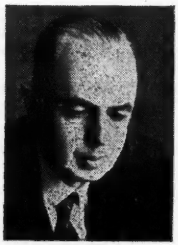
Mr. W. F. Campling, O.B.E., A.M.I.I.A., and **Mr. E. A. Davis** have been appointed to the board of De La Rue Insulation, Ltd. Mr. Campling has become works director, and will take charge of the West Chirton factory of the company, while Mr. Davis will be assisting him as technical director. Mr. Campling was until recently with the County of London Electric Supply Co. and associated companies with which he had served for twenty-three years. During the war he was seconded to the Air Ministry and Ministry of Aircraft Production, and became Director of Inter-Service Communications (D.D.C.C.P.).

Mr. F. G. Bacon, B.SC.(ENG.), A.M.I.MECH.E., A.M.I.E.E., **Mr. H. C. Blench,** M.C., and **Mr. J. M. Graham** have been elected to the board of International Alloys, Ltd. Messrs. Bacon and Blench are, respectively, director of production and director of sales, while Mr. Graham is a director of Almin, Ltd.

Two new appointments in the Valve Sales Department of the Mullard Wireless Service Co., Ltd., are announced:—**Mr. H. N. Miller** becomes sales supervisor and **Mr. G. W. Morris** becomes London area manager. Both gentlemen have been with the company for twenty years.

As a result of a generous gesture by **Mr. and Mrs. W. C. Gomersall,** of Shanghai, practically every employee of Johnson & Phillips, Ltd., received a food parcel, personally addressed, as an Easter gift. Mr. Gomersall is the managing director of China Engineers, Ltd., which has for many years handled J. & P. interests in China. The parcels were sent under the auspices of the Australian Food for Britain Organization and between two and three thousand were received.

Mr. J. W. Ryde, who, as briefly mentioned in our last issue, was recently elected a Fellow of the Royal Society for his services to pure and applied physics, is senior physicist at the Research Laboratories of the General Electric Co., Ltd., Wembley, and has been a member of the scientific staff of the laboratories since their foundation twenty-nine years ago. His research work, both practical and theoretical, has extended over a wide field of interests, including spectroscopy, gaseous electrical discharges, thermionic emission, crystal valves, and a number of optical and radiation problems. In particular he played a leading part in the development of electric discharge lamps and, during the recent war, devoted special attention to the problem of attenuation and scattering of centimetric radar beams in various meteorological conditions (work which developed from his early theoretical studies of the scattering of light in turbid media and in opal glasses in particular).



Mr. J. W. Ryde

Mr. S. E. Cawthra, previously in charge of Home Sales Department, Bull Motors, Ipswich, has been appointed a director of the M.G. Electrical Co., Colchester, which is now making electric motors as an addition to its repairing and contracting departments.

Five performances of "Young Mrs. Barrington," by Warren Chetham Strode, were given at Magnet House, Kingsway, on 15th-19th March by the Dramatic Society of the **General Electric Co., Ltd.** (head office). The combined efforts of the players, John Summers (producer) and the back-stage staff headed by Basil Stubbs (stage manager) were rewarded by the enthusiasm of crowded audiences on each night. The cast comprised Terence Cookman, Brenda Gilbert, Norah Symonds, Moira Threlfell, Joyce James, Patricia Parkes, Millar Dixon, Michael Molloy, John Hurst and Jean Freeman. The proceeds, after payment of expenses, are being devoted to the Westminster Children's Hospital. The Society will give its next show at the Fortune Theatre on 18th and 19th October.

A newly formed dramatic section known as the **Bridge House Players** attached to the Chief Regional Engineer's Office, L.T.R. Headquarters, G.P.O., have just completed their first year. Nearly all the members are newcomers to dramatic art. During 1947-48 the society staged the three-act comedy "George and Margaret" at the Borough Polytechnic as a first venture and the remainder of the season has been devoted to staging one-act plays at socials in the Waterloo Bridge House refreshment club.

In the first match of the season the Dunlop (London) Golfing Society, captained by Mr. Reay Geddes, defeated the **General Electric Co. Golfing Society** by six matches to five at Stoke Poges. In the morning the General Electric Co. won four singles matches to Dunlop's three and in the afternoon Dunlop won three four-ball matches to one.

Following an operation in January, **Mr. G. N. Green**, former Peterborough city electrical engineer and now chief engineer to the Eastern Electricity Board, has been working hard in connection with the nationalization scheme, and his doctor has now ordered him to have a complete rest until he is fully recovered.

The British Electricity Authority is inviting applications from State Registered Nurses for the post of sister at its London Headquarters.

Mr. D. V. Onslow has been appointed information officer to the British Electrical & Allied Industries Research Association in succession to **Mr. A. E. Tooke**, who has recently taken up a post with the British Electricity Authority.

Obituary

Mr. John W. Chipperfield, vice-president of Ferranti Electric, Ltd., of Canada, died suddenly on 16th March in Toronto. He was born in England and went to Canada in 1911. For a short time he was with Chapman & Walker and later was associated with Col. George C. Royce in the formation of the Ferranti Electric Co., of Canada. After the reorganization of the company, which became known as the Ferranti Electric, Ltd., Mr. Chipperfield as chief engineer was responsible for the building of the plant at Mount Dennis. He subsequently was appointed assistant general manager and later vice-president.

Mr. R. E. Horley.—We regret to record the death on 23rd March at the age of fifty-six, of Mr. Robert Eustace Horley, M.I.E.E., M.AM.I.E.E., works manager and chief engineer at the Eastleigh factory of the Pirelli-General Cable Works, Ltd., a position which he had held since 1928. He was a prominent member of Technical Committees of the C.M.A. and during the war he was a member of the War Emergency Technical Committee of the Cable Making Industry.

Mr. Alan Priestley, engineering assistant with the Liverpool Corporation Electricity Department and son of the late Mr. Percy Priestley, former tramways manager, died a few days ago. He was forty-three.

Mr. B. Snowball.—The death, on 4th April, is reported of Mr. Bartholomew Snowball, B.SC., A.M.I.E.E., of Hampstead Way, N.W.11.

Will.—Mr. Percy Olver, local manager and engineer at Leamington, of the Midland Electric Light & Power Co., Ltd., left £3,123 (£2,044).

Electricity Appointments

THE **British Electricity Authority** has announced the following appointments:—*Deputy commercial managers:* Mr. W. B. Noddings, M.ENG., M.I.E.E. (deputy commercial manager, C.E.B.), and Mr. R. Y. Sanders, F.S.S., F.R.ECON.S. (Development and Economic Section, C.E.B.). *Assistant commercial managers:* Mr. V. A. H. Clements, M.I.E.E., F.R.ECON.S. (departmental chief engineer (head of Power Department), North Eastern Electric Supply Co., Ltd.), Mr. C. M. Johnston, B.SC., A.M.I.E.E. (Commercial Manager's Department, C.E.B.), Mr. F. S. Naylor, B.SC., M.I.E.E. (chief engineer and manager, Islington), and Mr. R. H. S. Piercy, A.M.I.E.E. (assistant engineer, C.E.B., latterly with the Control Commission in Germany). *Assistant secretaries:* Mr. E. J. Guinness, D.S.C. (commercial manager, Electrical Development & Securities Trust, Ltd.), and Mr. F. A. Rawlings (financial officer, Electricity Commission). *Transmission construction engineer* (head office): Mr. J. A. Lee, M.I.E.E., M.I.MECH.E. (construction engineer, C.E.B.).

The following additional appointments have been made to the South Western Division of the Authority:—*Divisional accountant:* Mr. H. K. B. Lund, A.C.A. (district accountant, S.W.E. and S.W. Area, C.E.B.). *Divisional secretary:* Mr. R. C. Barrett A.C.I., F.C.I.S. (accountant and assistant secretary, Christy Bros. and associated companies).

Mr. R. Illingworth, O.B.E., M.I.E.E., who has been appointed generation engineer (constructional), London Division, of the British Electricity Authority, will, in addition, and for an unspecified period, continue at Poplar as senior executive officer.

Area Board Additions

The **South Western Electricity Board** announces that for reasons of health, Mr. H. E. Blackiston has been unable to accept the position of sub-area manager at Swansea, and the Board has appointed Mr. E. W. Jones (Mountain Ash), who was recently appointed a sub-area manager to control the Swansea undertaking for the time being.

The **South Eastern Electricity Board** has made the following further appointments:—*Solicitor:* Mr. W. H. Failes (London J.E.A.); *Department of Engineer-in-Chief:* Messrs. E. C. Thomas, A.M.I.E.E. (County of London Co.); T. Pickles, B.SC., A.M.I.E.E. (London J.E.A.); L. B. Whisson, A.M.I.E.E. (London J.E.A.); and A. J. Kidwell, A.M.I.E.E. (London J.E.A.). *Section Head (Transport and Stores):* Mr. R. H. Patman, A.M.I.E.E. (Y.E.P. Co.). *Section Head (Commercial):* Mr. M. W. Hime, A.M.I.E.E., F.I.E.S. (Y.E.P. Co.). *Secretarial:* Personal assistant to the chairman, Mr. E. J. Ward (London J.E.A.). *Sub-area commercial officers:* Northern (Croydon and West Kent), Mr. A. I. Spencer (County of London Co.); S.E. (East Sussex and West Kent), Mr. G. H. Ingamells, B.SC., A.M.I.E.E. (Hastings Corporation); Eastern (Kent), Mr. C. T. Nichol, B.SC., A.M.I.E.E. (County of London Co.). *Chief technical assistant to sub-area manager:* S.E. (East Sussex and West Kent), Mr. P. H. Taylor, A.M.I.E.E.

B.E.A. Guide

In the "B.E.A. Guide" which we have produced (page 8) the inscription under the portrait of Mr. N. R. Elliott makes it appear that he is chairman of the London Electricity Board; actually he is chairman of the South-Eastern Board as will be seen from the text. Also, he is a member, not associate member, of the Institution of Civil Engineers.

The portrait of Mr. J. Williams on page 37 is not that of Mr. Williams who has been appointed technical engineer in the London Division. but of Mr. J. Williams of the Cardiff branch of the General Electric Co., Ltd. We tender our apologies for these errors.

The Budget

IN introducing his Budget on Tuesday, the Chancellor of the Exchequer (Sir Stafford Cripps) said that he proposed to leave the question of further limitation of profits until next year when they would be able to see whether the promises not to increase the distribution of profits had been fully carried out.

The Chancellor announced changes in Purchase Tax which would be reclassified in four categories: Exempt, 33⅓ per cent, 66⅔ per cent and 100 per cent. The goods taxed at 100 per cent would be substantially those at present at 125 and 75 per cent. Tax on a large number of articles would be reduced from 50 to 33⅓ per cent and that on some goods be increased from 50 to 66⅔ per cent. Electric refrigerators would be moved up to the 33⅓ per cent class of goods. Lighting fittings and washing machines would be included in the goods reduced from 50 to 33⅓ per cent.

A levy would be placed on investment incomes at the rate of 2s. in the £ from £250 to £500, rising to a maximum of 10s. in the £ on £5,000 and over.

Married women in industry would enjoy the same allowances from earnings as single women.

Shorter Fluorescent Lamps

THE Electric Lamp Manufacturers' Association announces that in addition to the existing 80-W, 5-ft and 40-W, 4-ft fluorescent lamps at present on the market, 20-W, 2-ft and 40-W, 2-ft lamps will be on sale from 1st July next. The tubes will both be 1½ in. in diameter and fitted with standard bi-pin caps. They will be made in "daylight" and "warm-white" colours and their efficiency will be between three and four times that of the corresponding tungsten-filament lamps.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Wrongs to be Righted

IN recent months I have felt that the electrical industry has become so frustrated by shortages and controls that it is losing interest, and letting the initiative pass to our competitors. One of our troubles is that we are not looking forward to and planning for the time when the supply mains will be the sole medium for the distribution of energy for domestic purposes.

I am firmly convinced that there is no domestic service in which we cannot equal, and in most cases surpass our competitors, provided that we supply the right equipment.

Let us have cookers with the hobs designed throughout for use with one type of utensil, either non-radiant for use with special ground-base utensils, or radiant for use with ordinary utensils. Electric cookers are sometimes criticized on the ground that, size for size, they do not possess as many hot-plates as the boiling rings on our competitor's models; and as it is impossible to cover a rectangular plate with round saucepans why not keep the grill entirely separate? The tubular sheath type of hot-plate with reflector underneath, although very good, is difficult to clean. May it soon be superseded by the enclosed tubular sheath type.

The E.D.A. specification for interchangeability of replacement parts is a good idea, but it is made nonsense of by the fact that the differences in support bars and in hot-plate assembly thickness between different makes of electric cookers still make complete interchangeability of hot-plates impossible, even though the actual pins and sockets may be true to standard.

Let us have more scientifically designed lighting fittings for domestic use. Some do not seem to be designed to provide illumination at all, and some are so awkwardly constructed that it is almost impossible to clean them properly. Let us also see that lighting fittings are made from materials which will not soon go off colour.

On the rare occasions nowadays when we do sell ordinary electric fires let us concentrate on the high radiant efficiency reflector type (except for special cases where it would not be suitable), and let us see that the reflectors really will keep their finish.

On the question of heating, I feel strongly that instead of hiding behind the Order which permits us to refuse supply we should be pushing ahead with the application of off-peak heating to domestic premises, using cast iron, water, soapstone, etc., as the storage media and some form of control operating through the supply mains, or time switches, to cut the load at peak periods. This also applies to domestic water heating.

We could give the consumer better service by the pooling of patents or universal manufacture under licence. For example, this would allow for the fitting of the transformer type of radiant hot-plate to any make of electric cooker, and better design of fires.

Finally, the finish of some post-war appliances should certainly be improved.

*Walthamstow, E.*17. P. G. C. WILDING.

Monopoly Bill

THE text was issued last week of the Monopoly (Inquiry and Control) Bill presented by the President of the Board of Trade (H.M. Stationery Office, 6d.). The purpose of the Bill is stated to be " to provide for investigation of monopolies and restrictive arrangements in industry and trade and to give the Government special powers for dealing with those which are found to be working against the public interest."

It is proposed to set up a " Monopoly Commission " to investigate and report upon particular industries referred to it by the Board of Trade. Conditions to which the Bill applies include practices by two or more persons which result in the restriction of competition in the production or supply of goods or the application of processes which relate to at least one-third of all the goods or processes in question supplied or applied in the United Kingdom or any part thereof. Exports are similarly treated and are divided into exports for all or for particular markets. Agreements dealing with wages and employment are exempted.

The Commission may be asked to confine its report to a factual survey or it may be asked, in addition, to state whether it considers that the situation reported is against the public interest. In the second type of case it may be required to confine its inquiry to particular aspects.

Various Ministers are empowered to make Orders, subject to confirmation by Parliament, when the Commission has reported matters which work against the public interest. Such Orders may prohibit the making or carrying out of agreements, boycotts, conditional sales and preferential terms.

No criminal proceedings can be brought for a breach of an Order, but the Crown or any affected person may proceed against the offenders for an injunction or any other appropriate relief.

Electrical Supervisors

Speeches at Association's Annual Dinner

UPWARDS of 400 members and guests of the Association of Supervising Electrical Engineers attended the annual dinner on 2nd April. Among them were the first president, Mr. A. H. Dykes, the first executive chairman, Mr. Crowley, and six other past-presidents. After welcoming these and other eminent visitors, MR. H. NIMMO, the president, referred to the educational arrangements of the Association. These included the Highfield Shield, the Swann Diploma and the Thurston Trophy. It was hoped that the Association would be regarded by the British Electricity Authority as representative of installation supervisory grades.

MR. J. HACKING (deputy-chairman, B.E.A.) spoke of the need to put improvement of service in the forefront of the obligations to the community, which must necessarily precede benefits to individuals. This attitude had always been encouraged by the Association and much had been due to the initiative of its presidents. As an instance of the value of competition, the speaker cited the improvement in correct fault clearances on the grid from 85 per cent as a national average in 1937 to 95 per cent in 1947, a proportion that placed this country in the forefront of the world in regard to protective gear, which originated in the Merz-Price system. This improvement he attributed to different regional areas of the Central Electricity Board vying with one another to secure the best possible results. The B.E.A. was, as regards generation, the offspring of the C.E.B., but would work without the handicap of Section 13 of the 1926 Act and would own the generating stations. After the present generating plant deficiency had been got over (with the aid of standardization) progress should be rapid.

Greater Scope for Progress

SIR CYRIL HURCOMB (chairman, Transport Commission) believed that the new régime would offer much greater scope to technical progress than was possible with some 500 different undertakings restricted by municipal and other geographical boundaries. Standardization of voltage (which would have cost very much less if it had been undertaken earlier) and of consumers' tariffs would now be expedited. Without criticizing past achievements, it could be said that hardly any other industry was so suitable for large-scale organizations.

MR. P. GOOD (president, I.E.E.), who referred to the value of the A.S.E.E. as part of a well organized industry, also drew attention to its training activities in equipping a competitive people to benefit the public. The manufacturing side of the electrical industry was also playing a great part in work which secured food for this country. Railway electrification would greatly reduce fuel consumption and battery vehicles would be a boon in urban transport. He reiterated the view expressed in his presidential address to the Institution of Electrical Engineers that everything that could be performed by other power and heating agencies would be better done electrically. This applied also to means of lightening domestic labour.

Inventions Competition Result

THE result of the first competition for the annual Thurston Award of £10 for the invention judged to be the most valuable contribution to the advancement of utilization of electricity, the improvement of distribution, or installation technique is announced by the Association of Supervising Engineers. The winner is Mr. C. G. Crampton, Bearsted, Kent, for his " Magnetic Centrifugal Switch " designed mainly for use on single-phase motors, to cut out the starting winding, with or without a condenser. Since the introduction of the competition, Dr. Thurston has increased its value by presenting a Silver Trophy for annual competition which the winner will hold for one year. The trophy and cheque will be presented at the opening meeting of the London Lecture Session in October.

Developments in Portugal

THE first part of the Zezere River dam, which forms part of a large electrification scheme in northern and central Portugal covering the Cavado and Zezere River systems, has now been completed. The Portuguese Minister of Economy, Senhor Vieira Barbosa, said that the ultimate national output aimed at was 2,000 million kWh per annum, based on an installed capacity of about 1,000,000 h.p. Of this the Zezere River scheme would probably provide 800 million kWh, to which might ultimately be added (through a national grid system) the production of the Cavado-Rabagao and the Belver-Bracena River systems as well as the power stations on the Tejo and Ocresa Rivers.

It is hoped that the completion of the projects (scheduled for 1950) will ease the country's difficult fuel situation and provide industry with cheap power. Shortage of electricity has been a serious drawback in the development of Portuguese economy. The Government is confident that once the national grid system has become a reality the demand for power will quickly exceed the installed capacity. To meet this contingency power sites are being earmarked for future development on the Douro River in the northern part of the country.

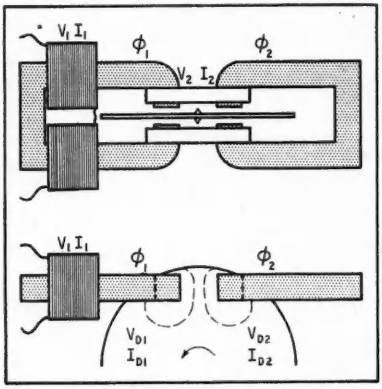
An Induction Instrument

Transformer Action Between Two Separate Cores

By Major E. H. W. Banner, R.E.M.E. (T.A.), M.Sc., M.I.E.E., F.Inst.P.

INDUCTION instruments for measuring a.c. have the great advantages of a long scale arc and visibility from a distance, enabling the relative position of the indicating pointer to be noted without necessarily relating it to the scale markings. The obsolete shaded-pole type was liable to large temperature and frequency errors, whereas all modern induction instruments combine first-grade accuracy with a large torque/weight ratio.

To create a torque by induction needs two



Elevation and plan of core air-gaps in relation to rotating disk

fluxes, which are required to be separated in time and in space. The moving element is free to rotate in the two fields and eddy currents are induced which react with the fluxes and so produce torque.

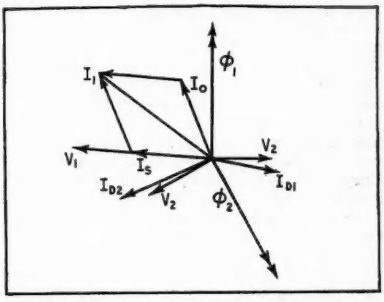
In the instrument described a transformer action is employed to couple the two cores, each with an air-gap through which the disk passes. One core carries the exciting winding and, in addition, it is coupled to the second core by two copper loops, one around the upper poles and one around the lower; in this way the second flux is induced. Thus ϕ_1 induces voltage V_2 in the loops, which lags 90 degrees, while current I_2 circulates due to V_2 with a lag depending on resistance and reactance of the loops; ϕ_2 is then produced by I_2 with a lag about 150 degrees behind ϕ_1. This angle of lag is not constant; it varies with temperature and with frequency.

When using the following notation: T, torque; I_1, line current = vector sum of $I_o + I_s$; I_o, exciting coil current; I_s, shunt current; V_1, terminal voltage; ϕ_1, flux produced by I_1 (or I_o); V_2, e.m.f. induced in loops by ϕ_1; I_2, current induced in loops by ϕ_1; ϕ_2, flux produced by I_2; V_{D1}, e.m.f. induced in disk by ϕ_1; I_{D1}, current induced in disk by ϕ_1; V_{D2}, e.m.f. induced in disk by ϕ_2; I_{D2}, current induced in disk by ϕ_2; θ, phase angle between ϕ_1 and ϕ_2; α, phase angle between e.m.f. in disk and its current; z, impedance of eddy current paths in disk; f, frequency; K & K^1, constants; then the general theory is expressed as $T = K [\phi_2 I_{D1} \cos \{90 + (\alpha - \beta)\} - \phi_1 I_{D2} \cos \{90 + (\alpha + \beta)\}] = K [\phi_2 I_{D1} \sin (\theta - \alpha) + \phi_1 I_{D2} \cos (\alpha + \beta)]$.

Now $V_{D1} \propto \phi_1 f$ and $V_{D2} \propto \phi_2 f$. Therefore, if z is the impedance of the eddy current paths in the disk, then $I_{D1} \propto \frac{\phi_1 f}{z}$ and $I_{D2} \propto \frac{\phi_2 f}{z}$.

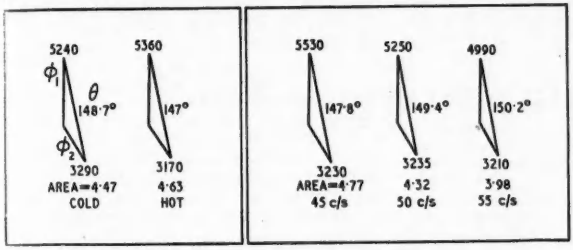
Hence $T = \frac{K^1 \phi_1 \phi_2 f}{z} \{ \sin (\beta - \alpha) + \sin (\theta + \alpha) \}$ which may be simplified to $T \propto \phi_1 \phi_2 \sin \theta$ at a given frequency.

For maximum torque the product $\phi_1 \phi_2 \sin \theta$ should be the maximum, which means that the optimum value of θ is 90 degrees and constant. But even that fixed value would be unsatisfactory for an instrument owing to temperature and frequency errors; so its increase by the transformer action to



Complete vector diagram, partly to scale

more than 90 degrees is beneficial because it will ensure that eventual reduction with rise of temperature and frequency will give a more nearly constant product, since ϕ_2 necessarily decreases as the resistance of the loops increases with temperature, as also does the disk itself. In addition to the e.m.f. induced in the loop, other e.m.f.s are induced (V_{D1} and V_{D2} due respectively to fluxes ϕ_1 and ϕ_2) in the disk. Similarly, currents flow in the disk as I_{D1} and I_{D2} respectively. It is, of course, the reaction of these currents that produces torque. Owing to the presence of two separate cores, the eddy current paths in the disk can be separated to produce the maximum torque.



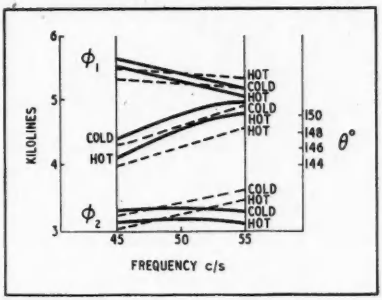
Vectorial representation of flux and phase angle parameters
Left: unshunted, varying temp. at 50 c/s. Right: shunted, const. temp., varying frequency

Experimental tests to determine ϕ_1 and ϕ_2 and θ at given temperatures and frequencies were made with a Drysdale a.c. potentiometer and search coils. The resulting parameters show that the torque, in any instance, is proportional to the area enclosed by ϕ_1 and ϕ_2 which is $\phi_1\,\phi_2 \sin\theta/2$ as shown. At 50 c/s the increase of area (and so torque) due to a rise of 30 deg C is about 3·2 per cent. The changes in each parameter are ϕ_1 increases by 2·4 per cent and ϕ_2 decreases by 3·6 per cent, while θ decreases (towards 90 degrees) by 1·2 per cent.

In the case of the shaded-pole instrument the area decreases with temperature, due to the fact that θ is less than 90 degrees. It is thus evident that temperature error is inherently compensated for in this instrument. The error, as determined by tests, is 0·08 per cent per deg C, reading low as temperature increases. The self-heating error is 0·6 per cent. These tests refer to a 6-in. ammeter at 50 c/s.

While it may be considered that an instrument for mains use may be subject to a frequency error without detriment, grid frequency fluctuations experienced in practice render correction desirable. Over a limited range, such as 45 to 55 c/s, the resultant flux in an iron-cored circuit is proportional to frequency, the current being constant and determined by the external circuit; consequently a frequency error is inherent. It can be overcome very simply by providing the exciting coil with a non-inductive shunt adjusted to pass a proportion of the line current. Increase of frequency will then result in less current passing through the exciting winding. In practice compensation is adequate when the exciting coil carries about 3·2 A for 5 A line current at 50 c/s. The simple vector diagrams of ϕ_1 ϕ_2 and sin θ with the parameter areas proportional to torque show how frequency increase causes the area to decrease, resulting in an error of + 0·04 per cent per c/s, which is within first-grade accuracy for moving-iron instruments.

The temperature error of the unshunted instrument is inherently satisfactory. The addition of a low temperature-coefficient shunt would increase the temperature error if no swamp were used; the latter would lead to considerable power consumption.



Changes of flux and phase angle with varying temperature and frequency
Full lines, shunted ; dotted, unshunted

A copper shunt has no effect on the temperature error and consequently may be employed, the absence of a swamp being no detriment. At 50 c/s and 20 deg C with a shaped disk there is an apparent consumption of 4·5 VA with an exciting winding of 120 ampere-turns for a 6-in. instrument.

No particular trouble is experienced in producing an equally satisfactory voltmeter

of this type. A shaped disk as for the ammeter permits a nearly linear scale to be employed,

TABLE I—SUMMARY OF PERFORMANCE

Torque	2 cm-gm/300°
Wt of movement	11 gm
Torque/weight ratio	0·18
Ammeter, shaped disk	4·5 VA
Ammeter, shaped disk	120 amp-turns
Temp. error	0·08 per cent per degC
Self-heating error, ammeter	0·6 per cent
Frequency error	0·04 per cent per c/s

but for indicating the voltage of nominally constant mains a square-law scale has the advantage of being more open in the working region. The self-heating error is negligible, due to the presence of the swamping resistance, which drops about 75-80 per cent of the total voltage. The temperature error is equal to that of the ammeter, 0·08 per cent per deg C.

Acknowledgment is due to Ferranti, Ltd., to Prof. J. Greig, and to Messrs. K. L. Smith and P. W. Gatliff, of King's College, London, the last for the measurement of the fluxes and phase angles for the construction of the vector diagrams to develop the theory.

Spain's Overseas Trade

Electrical Imports in 1946

THE Spanish Government has published statistics, by countries, of foreign trade in 1946. From these returns the following particulars of electrical imports into Spain have been extracted, and notes of increase or decrease on 1945 added. (45 Pes. = £1.)

	1946 Pesetas (000)	Inc. or dec. on 1945 Pesetas (000)
Dynamos, motors, fans, alternators, transformers, starters, etc., to 5 kg	673	+ 324
From Italy	210	+ *
„ *Switzerland*	176	+ 53
„ *Great Britain*	147	+ 48
„ *United States*	38	+ 14
Ditto, from 5 to 25 kg	759	+ 190
From Great Britain	37	+ *
„ *Switzerland*	281	− 52
„ *Sweden*	183	+ 93
„ *United States*	130	+ 96
„ *Italy*	83	+ 80
Ditto, from 25 to 100 kg	700	− 161
From Belgium	88	+ *
„ *Switzerland*	321	− 221
„ *Great Britain*	78	+ 44
„ *United States*	115	+ 104
„ *Sweden*	46	− 28
Ditto, from 100 to 500 kg	1,048	− 519
From Switzerland	414	− 793
„ *Great Britain*	162	+ 147
„ *United States*	184	+ 113
„ *Sweden*	77	− 2
Ditto, from 500 to 1,000 kg	234	− 591
From Denmark	22	+ 22
„ *Switzerland*	173	− 488
„ *Czechoslovakia*	15	+ 15
Ditto, from 1,000 to 3,000 kg	821	− 385
From Switzerland	486	− 615
„ *Sweden*	75	+ 13
„ *Great Britain*	82	+ 82
Ditto, from 3,000 to 5,000 kg	665	− 3
From Great Britain	61	+ *
„ *Switzerland*	528	+ 94
Ditto, over 5,000 kg	4,146	− 3,896
From Switzerland	3,047	− 4,616
„ *Sweden*	956	+ 709
Generating sets and rotary convertors up to 1,000 kg	244	+ 40
From Sweden	131	+ *
„ *Switzerland*	38	− 152
Ditto, from 1,000 to 5,000 kg	371	+ 284
From Great Britain	145	+ *
„ *Sweden*	75	+ 47
„ *Switzerland*	28	− 3
Ditto, over 5,000 kg	7,116	+ 5,212
From Switzerland	1,604	− 244
„ *Great Britain*	5,252	+ 5,252
Dry batteries and parts	24	+ 22
From Great Britain	20	+ 20
Accumulators	161	+ 123
From Sweden	40	+ 29
„ *United States*	41	+ 17
Electrical meters, and electro-medical apparatus	1,475	− 836
From France	407	+ 407
„ *Switzerland*	580	− 896
„ *Sweden*	230	− 285
Switchboards	221	− 423
From Switzerland	167	− 375
„ *United States*	14	− 48
„ *Great Britain*	24	+ 24
Heaters, cookers, hotplates, etc.	65	+ 2
From Italy	9	+ 9
„ *Switzerland*	36	+ 22
Lamps, complete	127	+ 14
From United States	96	+ *
„ *Switzerland*	18	+ *
Mercury-vapour lamps	258	+ 174
From Holland	94	+ 84
„ *United States*	69	+ 19
„ *Great Britain*	76	+ 76
Cables over 1 cm diam	291	+ 164
From Great Britain	254	+ 152
Cables not exceeding 1 cm diam	97	− 119
From United States	34	− 176
„ *Great Britain*	61	+ 61
Insulated wire less than 0·5 m	95	+ 43
From Great Britain	56	+ 36
„ *United States*	12	− 8
„ *Switzerland*	16	+ 13
Telegraph and telephone apparatus	5,724	+ 2,892
From United States	1,849	+ 1,809
„ *Great Britain*	2,424	+ 1,198
„ *Sweden*	528	+ 435
„ *Switzerland*	193	− 299
Switches, circuit breakers, lamp-holders, etc., up to 1 kg	152	+ 52
From United States	61	+ 51
„ *Great Britain*	15	+ 15
„ *Switzerland*	43	− 38
Ditto, 1-100 kg	422	− 614
From Germany	22	− 20
„ *Switzerland*	294	− 460
„ *Sweden*	48	− 114
Ditto, 100 kg and over	653	− 980
From Switzerland	468	− 1,051

*Comparable figures not available

COMMERCE and INDUSTRY

Cable Makers' Wages.

THE Joint Industrial Council for the Electrical Cable Making Industry has decided that the rate of a leading hand or working charge hand should be 1d. per hour above the J.I.C. classification rate appropriate to the highest grade of work being performed under his direction.

The Council has also decided that the rates of pay for plumber jointers both in London and in the country shall be increased by 1½d. per hour with consequential increases to plumber jointers' mates; that the out-working allowance shall be raised from 5s. to 6s. per day; and that in Clause 9 of the Agreement of 16th October, 1946, the words "four times a year" shall be amended to read "five times a year." In this last connection, it is understood that employers will allow sufficient leave of absence, with pay for normal day-time working hours, to enable employees to reach home at a reasonable time.

The above increases in wages, etc., are to come into operation on the third pay-day in April.

Electrical Appliances for Australia

At a recent meeting of the Electrical Safety Committee of New South Wales, which is administered by the Standards Association of Australia on behalf of the Electrical Authority of that State, the members of the Committee expressed concern at the many instances of United Kingdom appliances of good quality failing to meet Standards Association of Australia approval and test specifications in respect of features which could easily have been rectified by the British manufacturers, had they been sufficiently familiar with Australian requirements for electrical equipment. The Committee therefore asked the Standards Association of Australia to bring this matter to the attention of the British Standards Institution in the hope that some appropriate organization in Britain could give British manufacturers reliable advice regarding requirements set out in the Australian approval and test specifications. Full information is available from the library of the British Standards Institution, 24, Victoria Street, London, S.W.1.

New Iron and Steel Order

In accordance with arrangements announced by the Paymaster General last December, the Control of Iron and Steel (No. 63) Order, 1948, which came into operation on 1st April, cancels all outstanding "M" forms and all outstanding orders covered by them for iron and steel, other than sheets and tinplate, terneplate, blackplate, etc., as specified Except where exemptions have been notified, consumers must authorize under the new I.S. Authorization any order for delivery after 31st March.

Australian Standards.

Purchase Tax Notices

Notices Nos. 78 (Goods Chargeable with Purchase Tax) and 78C (Stationery, Office Requisites and other Paper Manufactures) issued by the Commissioners of Customs and Excise, have been revised and copies of the new editions dated February, 1948, are being sent by local Collectors of Customs and Excise to traders registered for Purchase Tax purposes. Copies have been circulated also to trade associations and the trade press principally concerned.

"Save Fuel" Campaign at Twickenham

The accompanying illustration shows the last of a series of window displays arranged at the Twickenham showrooms of the London and Home Counties J.E.A. in conjunction with local industries in a "Save Fuel" and "Keep off the Peak" campaign. Its intention was to impress consumers with the fact that keeping off the peak hours and general economy helped industrial consumers within their own locality. The district is predominantly residential, and the fact that there is, nevertheless, an important industrial demand is usually overlooked by the ordinary domestic consumer.

Part of a window display at Twickenham emphasizing the importance of electricity economy

The campaign started with a general exhibition of products of local manufacturers, followed by a series of special displays of individual manufacturers' products along the same lines at three-weekly intervals. The whole of the

display work was carried out by the Authority's own Display Department. There have been campaigns along similar lines in the Dorking, Sutton and Surbiton districts.

Cardiff Wholesalers' Showrooms

The new premises of Curran Industries, Ltd., wholesale electrical distributors, in the centre of Cardiff, include up-to-date showrooms, to cope with increasing trade, both home and export. A wide range of electrical and radio goods is displayed.

Part of the Cardiff showrooms of Curran Industries, Ltd.

Surveying Overhead Line Routes

The North-Eastern Electric Supply Co., Ltd., has been using an aeroplane in the North Riding of Yorkshire to help in the plotting of proposed overhead lines. It is understood to be one of the first occasions that a plane has been used for this purpose in this country.

North-West London Exhibition

Norwest Services, Ltd., electrical and gas contractors, Edgware, organized an exhibition of domestic appliances which was held at the Empress Hall, Edgware, from 1st to 3rd April, being opened by the Mayor of Hendon. Apart from cooking and heating equipment, etc., there was a large display of television receivers. A "domestic quiz" was conducted by Miss Joan Gilbert.

Competition with Switzerland

Swiss competition based on lower wages, longer hours, cheaper and better quality iron ore and cheaper coal obtained from Poland, has resulted in the loss to C. A. Parsons & Co., Ltd., of an order for turbo-generating plant to the value of £500,000. Sir Claude Gibb, chairman and managing director of the company, said that the order normally would have gone to his company. He also mentioned that about £10,000,000 worth of export trade orders were going through the shops including orders valued at about £2,500,000 in dollars.

Prizes for Welding

Competition for the award in 1948 of the Bronze Medal endowed by Sir William J. Larke, K.B.E., a past-president, is invited by the Institute of Welding. A first prize of £50 will be awarded to the winner of the medal and there will be other prizes to a total value of £50. The competition is open to members, associate members, companion members, graduates, associates and student members of the Institute of Welding. Candidates have to submit an original unpublished paper on one or more of the following subjects :— Gas, welding, arc welding or resistance welding, dealing with practical applications embodying specific details of welded work; welding technique, gas or arc welding; and design of welding equipment, gas, arc or resistance welding. Entries should reach the Secretary, Institute of Welding, 2, Buckingham Palace Gardens, S.W.1, by 1st October.

Glasgow Apprentice Reinstated

When Glasgow Reinstatement Committee heard an application for reinstatement of an apprentice electrician with John Robertson, 147, Bath Street, a representative of the firm stated that owing to present restrictions their employees had been reduced to 39 compared with 199 in 1944. It was maintained that it was not reasonable to reinstate applicant because under the interrupted apprenticeship scheme he would have to be paid a journeyman's rate. The Committee ordered reinstatement and awarded compensation of £14 11s 6d. The employers were granted leave to appeal against the Committee's decision.

New Divisional Headquarters

The Merseyside and North Wales Electricity Division has moved to new offices at British Electricity House, Clark's Gardens, Woolton, Liverpool (telephone: Garston 4981-5).

The headquarters of the South Eastern Division of the British Electricity Authority has moved to British Electricity House, Lower Ham Road, Kingston-upon-Thames. (Telephone: Kingston 8822; telegraphic address: Beeyay, Kingston-upon-Thames). The new

offices are situated on the site of the new power station, on the south bank of the River Thames, close to Kingston Bridge.

Winchester Jubilee

A dinner was held at Winchester last week to commemorate the jubilee of the municipal electricity undertaking and its handing over to the British Electricity Authority. Many past and present members of the staff were present including Mr. A. N. Bott, the engineer and manager, and Mr. R. Ayton who held the same position from 1911 to 1947. Others in the company were Messrs. N. F. Gadsdon (B.E.A.), the Mayor, Councillor Mrs. D. Crompton, Mr. H. Nimmo, chairman, Southern Electricity Board, and Mr. F. W. Kempton, town clerk, secretary to the Southern Board.

Belfast Engineer's Salary

For the second time, the proposed salary of the Belfast city electrical engineer and manager, Mr. W. J. McC. Girvan, was discussed at a full meeting of the Corporation last week. The recommendation of the Electricity Committee was that the salary be raised from £2,000 to £2,500, in accordance with the National Agreement of 1941. A bonus on the cost of living on the present salary is in operation. During the debate, the Lord Mayor (Councillor W. F. Neill, M.P.), said that the amount the Council was asked to vote was a small amount in itself, but the principle was large. The matter was referred back to the Electricity Committee to make a revision that would not place the electrical engineer in a better financial position than those of electrical engineers in similar positions in England.

Electricity Charges and Rebates

The Electricity (Price Control) (Revocation) Order, 1948 (S.I. 1948 No. 596, H.M. Stationery Office, price 1d.), revokes the previous Order which prohibited discounts, rebates and reductions of charges during the period before the transfer of undertakings to the British Electricity Authority.

Möhne Dam to be Rebuilt

Reuter reports from Düsseldorf that the Möhne Dam, in Westphalia, destroyed by the Royal Air Force is shortly to be rebuilt.

Restrictions on Development

Reference was made at a recent meeting of the Oldham Electricity Committee, to the suggestions of the Electricity Commission for limiting to essential needs the connection of new supplies and the provision of appliances on hire or hire purchase. The chairman (Councillor F. Kenyon) said the request did not appear to affect private retailers of electrical appliances. One member said there was a lot of material in the shops, some of which did not do credit to the makers. In the latest report on the electricity showrooms covering the period to 20th March, it is stated that no additional hired electrical apparatus has been connected to the supply.

Telephone Equipment for Iraq

The bulk of the orders for telephone exchanges, wireless sets, broadcasting equipment, etc., placed with British firms during the years 1945-47 have now arrived in the country. This was recently stated by Sayid Bakir Ahmid, Director General of Posts and Telegraphs, who also said that further orders for telephone, wireless and broadcasting equipment would be placed in Britain in the near future, after approval by the Minister of Communications.

I.E.E. Western Centre

The Abernant Lake Hotel, at the entrance to the Irfon valley, Llanwrtyd Wells, is to be the venue for the annual general meeting and summer meeting of the Western Centre of the Institution of Electrical Engineers from 28th to 31st May.

History of Scarborough Undertaking

The development of the Scarborough electricity undertaking is placed on record in a booklet "The Electricity Supply of Scarborough, 1893-1948." In 1894 the Corporation, for the sum of £525, transferred its powers to the Scarborough Electric Supply Co., and the undertaking was acquired by the Corporation in 1926 for £173,105. Mr. F. J. G. Holden, chief engineer to the company, continued as borough electrical engineer until the following year when he was succeeded by Mr. E. J. Jarvis, who in 1936 was appointed to a similar position at Kingston-on-Thames. Since then Mr. W. K. Fleming has been "chief" of the undertaking.

New Prices for Malayan Tin

The Ministry of Supply announces that as from 7th April the buying price for Malayan metal has been adjusted from £500 to £504 and the selling price from £504 to £505 10s. per ton ex smelter (Penang or Singapore). Inquiries should be made to the Directorate of Non-Ferrous Metals, 20, Albert Street, Rugby.

Pressure Die Casting

A well-produced booklet of 64 pages entitled "Pressure Die Casting," in aluminium, magnesium and zinc, but excluding copper base alloys, has been issued by the Birmingham Aluminium Casting (1903) Co., Ltd., Dartmouth Road, Smethwick, Staffs. It is not a textbook, but a practical guide to the avoidance of pitfalls by the observance of simple rules. The respective advantages of each of the three main methods of casting in this way are described with the aid of diagrams. Detailed data are given on the choice of alloys, their compositions

and factors which influence the soundness of the finished products, while nineteen pages illustrate typical routine castings for a variety of industries, many of them electrical, each briefly describing the way in which the component was made.

Increase in Production

The interim index of industrial production published in the March " Digest of Statistics " (H.M. Stationery Office, 2s. 6d.) gives the provisional figure for January as 122 (the average for 1946 is taken as 100). In the last three months of 1947 the index figures were 121, 123 and 115, respectively.

Power Companies' Association

A meeting of the Incorporated Association of Electric Power Companies was held on 25th March when a resolution was passed that the Association should be wound up voluntarily. The president, Mr. J. Paterson, of 206, St. Vincent Street, Glasgow, C.2, was appointed liquidator.

French Turbo-Generators for Egypt

The French electrical equipment company " Alsthom " has received an order from the Egyptian Ministry of Works for two turbo-generator groups of 10,000 kW and one 20,000-kW group, as well as five boilers and electrical control equipment for a new power station north of Cairo.

Iron and Steel Institute

The annual general meeting of the Iron and Steel Institute is to be held at the Royal Institution of Chartered Surveyors, 12, Great George Street, London, S.W.1, on 5th and 6th May.

Trade Announcements

James Scott & Co. (Electrical Engineers), Ltd. (Transmission Department) has moved to new premises at 23, George IV Bridge, Edinburgh, 1 (telephone: Edinburgh 34821).

Tricity Cookers, Ltd., 109, Kingsway, London, W.C.2, are now responsible for export orders and inquiries covering the domestic electric manufactures of South Wales Switchgear, Ltd. South Wales Switchgear, Ltd., Blackwood, Mon., will continue to be the export office for h.v. and l.v. switchgear and power transformers.

A. Cooksley & Co., Ltd., have appointed Mr. Gordon Laird, 38, Sandhill, Newcastle-on-Tyne, as agent for Northumberland and Durham.

British Insulated Callender's Cables, Ltd., will be closing its Anchor Works, Leigh, from 3rd to 10th July. The Prescot and Helsby Works and Willenhall Foundry will be closed from 24th July to 2nd August. A skeleton staff will deal with customers' urgent requirements. Erith Works will not be closed as holidays will be staggered.

Trade Publications

Aberdare Cables, Ltd., Aberdare, Glamorgan, South Wales.—Technical brochure describing the manufacture of cables.

A.B. Metal Products, Ltd., Hatton Works, Great South West Road, Feltham, Middlesex.—Priced folder on moulded switches, plugs and sockets for domestic use.

W. T. Henley's Telegraph Works Co. Ltd., 51-53, Hatton Garden, London, E.C.1.—Priced catalogue of rubber cables.

The Midland Dynamo Co., Ltd., Leicester.—Leaflet describing " Quickway " armature and coil winding machines.

Allen West & Co., Ltd., Brighton.—Leaflet 1408/A/1 on the " PF " fuse for h.v. transformer protection.

Sloan Electrical Co., Ltd., 41, Kingsway, London, W.C.1.—Catalogue and price list of fluorescent lamps and fittings.

Thos. Ward, Ltd., Albion Works, Sheffield.—Illustrated brochure recording achievement in factory planning and installation.

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month from 31st March :—

ELECTROLLER. No. 654,493, Class 10. Electrically-operated massage rollers.—R. H. Stevens, " Oban," Foxgrove Avenue, Guildford, Surrey.

VENT-AXIA (design). No. 653,321, Class 11. Ventilating fans and self-contained electric fan ventilators.—Vent-Axia, Ltd., 9, Victoria Street, London, S.W.1.

VERTIGLO. No. 656,529, Class 11. Installations for lighting.—C.W.C. Equipment, Ltd., 66, Victoria Street, London, S.W.1.

INFORMATION DEPARTMENT

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Dutch inquirers ask for the name of the makers of a specially-designed relay for tramway switches, formerly made in the " Rothermere " factory.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Rewiring an Abattoir

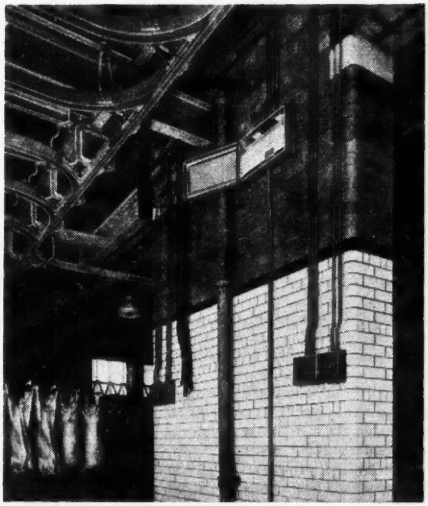
Installation Difficulties Encountered and Overcome

THE lighting installation of the Halifax Corporation abattoir, consisting of 300 points with a total loading of 60 kW, representing 20 kW per phase, has recently been rewired with mineral insulated copper-clad cable to the specifications of the electrical engineer and manager, Mr. A. G. Connell. Many difficulties were encountered and eventually overcome by N. G. Bailey & Co., Ltd., of Manchester, who worked in close co-operation with Mr. E. G. Smith, installation superintendent of the Borough Electricity Department.

The abattoir covers an area of 1·25 acres (5,058 sq metres). The maximum annual slaughtering capacity is 24,000 beasts, 67,500 sheep, 12 000 lambs and 25,500 pigs — considerably more than the numbers dealt with at present.

The original installation provided poor illumination by present day standards. It consisted of 200 points wired in t.r.s. cable on cleats with oil-immersed rotary switches mounted in wooden boxes, pendant fittings with open shades and bayonet-cap lampholders. The presence of various fumes peculiar to an abattoir and much moisture due to the heavy condensation at all times had a deleterious effect upon the insulation of the wiring and by 1945 it had become dangerous. The switches were not robust enough and many sections were "live." Upon handling the insulation it crumbled away, exposing the bare conductors, which were also in a state of corrosion.

With the failings of the existing wiring in mind the possibilities of other systems were explored and a specification for a new installation drawn up. Although it was slightly more expensive, "Pyrotenax" was finally adopted because of its moisture and corrosion resisting properties.



Each end of cooling hall showing switches and distribution board. Note corrosion of girders and runways

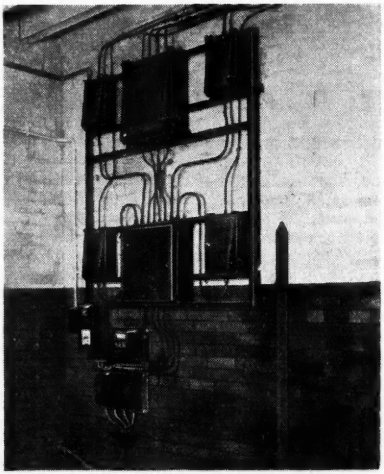
A 0·2 sq in. 3-phase and neutral cable, separately fused at the local substation, terminates at cut-outs situated in the hay store on the ground floor of the abattoir. They incorporate 160-A time-lagged cartridge fuses and (avoiding the use of a main switch) are directly connected to the busbar chamber feeding the switchgear.

The galvanized-iron watertight switchgear, which is mounted on an iron framework with the busbar chamber, consists of four single-pole

and neutral switches fused at 60 A and a triple pole and neutral switch fused at 100 A. Cartridge fuses are used exclusively.

Nine distribution boards, also galvanized iron and watertight, are situated at strategic points in the building from which 0·002 sq in. two, three, four and seven core cables feed the junction boxes, fittings and switches. Rotary switches, some of which are key operated, are employed throughout, mounted at 5 ft 6 in. (1·68 metres) from ground level to avoid damage by cattle.

The connection and terminal boxes are made



Main switchgear and cut-outs in the hay store

of " Everdur," a copper-silicon-manganese alloy with the strength of medium carbon steel, manufactured under licence from I.C.I. Metals, Ltd., by Walsall Conduits, Ltd. To provide adequate protection against the ingress of fumes and moisture rubber gaskets are fitted under the lids of all boxes and lead washers under the fixing screws.

The interior fittings, with the exception of two well-glass units in the boiler house, are of the " Benjamin " totally enclosed type with 18 in. (46·12 cm) diameter shades. The drops to the fittings are copper conduit, connection being made to the lampholders by " Rockbestos " glace enamelled flexible cord. Normal street fittings are used for the outdoor points.

Some difficulty was caused by the presence of overhead runways in all sections of the abattoir for which reason as much cable as is possible is run along the walls. In many instances it was necessary to fix " T " section joists between adjacent girders to provide fixing for the fittings.

As it was desirable to reduce the use of ferrous metals to negligible proportions, all screws are brass and spacing saddles copper. Spacers are used in conjunction with saddles so that the cable is raised 0·25 in. (6·4 mm) from any wall or girder surface. Where damage is a possibility the cable is run inside a copper conduit which is filled with compound to prevent the accumulation of condensed vapours.

Particular attention was paid to the fixing of gland seals. Before fixing, the cable was heated up to about 1 ft (30·5 cm) from the end, to drive out any moisture present and lead washers were placed under the lock nuts. As a final precautionary measure, the entire installation, including the backs of all fittings, was treated with a corrosion resisting enamel.

Earthing is by means of a 1 in. by $\frac{1}{8}$ in. (25 by 3 mm) copper strip between the switchgear panel and a $\frac{5}{8}$ in. brass stud incorporated in a " tee-piece " in the incoming 2 in. copper cold water main.

Manufacturers other than those mentioned above are:—Switchgear, Prentice, Ltd.; rotary and key switches, Walsall Conduits, Ltd.; flexible cord, British Insulated Callender's Cables, Ltd.; interior lighting fittings, " Benjamin " manufacture, General Electric Co., Ltd.; and outdoor lighting fittings, the Revo Electric Co., Ltd.

Heavy-Duty Breakers

IN a paper recently read before the American Institute of Electrical Engineers, Mr. Rietz said that early last year the U.S. Bureau of Reclamation had represented that 230-kV circuit breakers for Grand Coulee would need to be capable of rupturing 10,000 MVA. At that time the maximum duty was 3,500 MVA, but factory tests had indicated that 5,000-MVA breakers would be feasible, although designs had not been prepared. Two designs of General Electric 230-kV, 3,500-MVA, 800-A breakers were available for field tests at Grand Coulee Dam, a low-oil-content impulse type and a conventional tank multi-break unit. The former was based on a design developed in the early 1930's for Boulder Dam, and demonstrated desirable characteristics on line-charging currents where interruption is positive and restriking is unknown. Interrupting times were within three cycles from 0 to 100 per cent of rating. Field and factory data were also available on the tank breaker with three-cycle interrupting time and twenty-cycle reclosing time. Both breakers interrupted nearly double their rating without reaching their limit. It was established that line-charging currents could best be interrupted by oil breakers of the impulse type, although multi-break could be combined with resistors to give satisfactory performance, and that a reclosing time as low as 12 cycles was possible at 230 kV and the higher interrupted ratings. It was concluded that ratings of 7,500 MVA could be obtained at this voltage, and that only slight changes in design would be necessary to obtain the 10,000-MVA breakers to the Bureau of Reclamation specifications.

NEW BOOKS

Principles of Electricity and Magnetism. Shadow in Illumination.

Theory and Applications of Electricity and Magnetism. By Charles A. Culver. Pp. 594; figs. 407; index. McGraw-Hill Publishing Co., Ltd., Aldwych House, Aldwych, London, W.C.2. Price in U.K. 30s.

This book is intended as an exposition of the fundamental principles in such a way as to lay the foundations also for advanced study. Although the approach is primarily theoretical, the experimental basis of the theory is adequately discussed and there are useful chapters on instruments and methods of measurement. The standard classical theory required for a general degree is covered and there is also an outline of modern developments in electronics and atomic physics, including brief descriptions of the electron microscope, betatron and cyclotron. Certain technical aspects of the subject of special interest to the electrical engineer are also emphasized.

A striking feature of the book is the clarity of style and the elegant lay-out. Unlike many electrical text-books, this one is a pleasure to read; the author has concentrated on presenting essentials clearly and succinctly rather than on providing the reader with a wealth of detail. Each chapter carries a set of numerical examples of a relatively easy character.

The English reader may possibly find some of the terminology occasionally unfamiliar, but it is scrupulously consistent and in accordance with the latest recommendations of the American Institute of Electrical Engineers. It will be interesting to see how soon terms like "stat coulomb", "abvolt" or "inductor" become popular usage in this country.

The book can be strongly recommended to students embarking upon the first year of their degree course, whether their ultimate interests incline towards pure physics or electrical engineering.—F.G.G.A.M.

Shadow and Diffusion in Illuminating Engineering. By K. Norden, Ph.D. Pp. 165; figs. 72; index. Sir Isaac Pitman & Son, Ltd., 39, Parker Street, Kingsway, London, W.C.2. Price 25s.

Although this book irresistibly brings to mind the classical story of the curate's egg, those parts of it which are good are so good that they should be studied by every lighting engineer and, in fact, everyone concerned in any way with the design of systems of lighting. The author very rightly says that, except in a very few instances, the shadow-producing qualities of any lighting installation have not, hitherto, been treated otherwise than purely descriptively and he points out that some method of measuring shadow production and diffusion is greatly to be desired. He has devoted many years of careful study to the problem and whether he has succeeded completely or only partially can best be judged by a perusal of the present book. Many will probably feel that, again, the most valuable chapters are those in which the phenomena of shadow production are treated descriptively and will regard his attempt at a quantitative treatment as too complicated for adoption in everyday lighting design.

The book is unfortunately marred by eccentricities of style and diction caused by the author's imperfect command of the English language and this probably also accounts for the fact that several of the special terms which he has coined (e.g., "shadowy illumination") seem to be somewhat unhappily chosen.—J.W.T.W.

Books Received

A Practical Course in Magnetism, Electricity and Radio (3rd Edition). By W. T. Perkins and A. Charlesby. Pp. 312; figs. and index. George Newnes, Ltd., Tower House, Southampton Street. London, W.C.2. Price 10s. 6d.

Magnetic Materials. By F. Brailsford. Pp. 156; figs. 86; index. Methuen & Co., Ltd., 36, Essex Street, London, W.C.2. Price 6s.

La Foudre. By Charles Maurain. Pp. 215; figs. 7; index. Armand Colin, 103, Boulevard, Saint Michel, Paris V^e^. Price 120 f.

Electric Accumulator Manual. By T. C. Elliott. Pp. 166; figs. 123; index. George Newnes, Ltd. Price 16s.

The Performance and Design of Alternating Current Machines (2nd Edition). By M. G. Say. Pp. 636; figs. 378; index. Sir Isaac Pitman & Sons, Ltd. Price 25s.

Electric Wiring of Buildings (2nd Edition). By F. Charles Raphael. Pp. 353; figs. 185; index. Sir Isaac Pitman & Sons, Ltd. Price 20s.

Electronic Devices. By H. A. Miller. Pp. 100; figs. 71; index. Sir Isaac Pitman & Sons, Ltd. Price 12s. 6d.

Chemical and Electro Plated Finishes. By H. Silman. Pp. 414; figs. 131; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 30s.

Electricity, Magnetism and Modern Physics. By G. T. P. Tarrant. Pp. 468; figs. 213; index. J. M. Dent & Sons, Ltd., Aldine House, Bedford Street, London, W.C.2. Price 15s.

Radio and Car Battery Handbook. By Charles Fleming. Pp. 128; figs. 16; index. George Newnes, Ltd. Price 5s.

ELECTRICITY SUPPLY

Back-o'-th'-Bank Extension. Yarmouth Station Opposed.

Bolton.—NEW SET COMMISSIONED.—Mr. A. Robens, Parliamentary Secretary to the Minister of Fuel and Power, attended the commissioning of the third 31,250-kW turbo-alternator set at the Back-o'-th'-Bank generating station, on 31st March. At a luncheon given in the Town Hall, he said this was one of a large number of sets due for commissioning this year—the target was 1,000,000 kW. Even if that target was reached, there would be a shortage of electricity next winter. If the weather was cold, peak demand in the winter of 1948-49 was expected to reach 11,680 MW. Plant available to meet that was expected to have a total capacity of 10,550 MW. There would be a gap of 1,130 MW, which was likely to be reduced to 450 MW the following winter. By 1950-51, it was hoped to have a small surplus. Hence, the Ministry was trying to prevent the demand from growing so fast. Concerns which had been using auxiliary generating plant to relieve public supply had been asked to keep it running until the end of April and to have it ready for emergencies until the end of May—as a safeguard against the possibility of electricity shortage during the next two months.

Brighouse.—DISTRIBUTION REINFORCEMENT.—The Electricity Committee has applied for consent to the borrowing of £27,946 in connection with the modified scheme for the reinforcement of the distribution system.

Great Yarmouth.—OBJECTION TO PROPOSED POWER STATION.—Believing that the establishment of a new power station on the South Denes would harm the town's future, the Town Council has decided that it cannot support the proposal. Strong protests were made by the Herring Fishing Industry and the Council received a deputation. It is claimed that coal dust pollution would jeopardize herring fishing locally as well as the whole town's summer holiday season. It is also suggested that the power station would be of no rateable value and would occupy land which could be used for factories. In favour of the proposal it is urged that it would help to relieve unemployment locally.

Leicestershire.—ELECTRICITY FOR SMALL HOLDINGS.—The County Council Small Holdings Committee recommends the provision of electrical installations at eighteen holdings at Misterton and Gilmorton and two holdings at Ravenstone.

Portsmouth.—NEW LANTERNS FOR STREET LIGHTING.—The first public street lighting installation using G.E.C. Dioptrion lanterns has just been switched on at Portsmouth. They are mounted on existing steel columns and are used with 250-W "Osram" high-pressure mercury vapour hard-glass lamps in a scheme comprising 40 points. The Dioptrion lantern is constructed almost entirely of glass, but by means of the prisms used in the optical system more accurate control of the light is possible at high glare angles. In consequence, the amount of light lost upwards above the horizontal level is very considerably reduced, the greater part being redirected on to the road surface.

Scotland.—SCHEMES CONFIRMED.—The North of Scotland Hydro-Electric Board has received confirmation of the following:—Constructional Scheme No. 8—Kintyre-Glen Lussa Project—Campbeltown-Tarbert transmission lines; Distribution Scheme No. 15—Zetland; Distribution Scheme No. 25—Seil, Luing and Easdale Area; Constructional Scheme No. 13—Storrlochs Project.

Skipton.—DISCOUNT SANCTIONED.—The Ministry of Fuel and Power has authorized the Urban District Council to make an allowance of 10 per cent on electricity accounts, in respect of meter readings up to 31st March.

Overseas

Ceylon.—IRRIGATION AND POWER SCHEME.—A £3,000,000 dam will be part of a big irrigation scheme planned for the North-Eastern Province of Ceylon. The dam will irrigate 60,000 acres of paddy giving two crops a year, provide a 9,000-h.p. hydro-electric plant, and supply water for nearly 20,000 people.—*Reuter.*

New Zealand.—DIFFICULT PERIOD.—Although the period covered by the latest report of the Christchurch undertaking (to 31st March, 1947) is described by the general manager (Mr. E. Hitchcock) as uneventful from an operating viewpoint, it was followed by some weeks of acute power shortage. An emergency committee of the Council met daily for more than three weeks at the worst period, when the State Hydro-electric Department required consumption to be kept to 30 per cent below that in the corresponding week of the previous year. Mr. Hitchcock observes that, in whatever way the situation is viewed, there is electrically a long period of "discipline" ahead when selection and discrimination in the acceptance of new load will be of critical importance. In 1946-47 the Department sold 182·5 million kWh (against 159·4 million in 1945-46) and there was a net profit of £29,749 (£32,370).

United States.—T.V.A. OUTPUT TO BE RAISED.—President Truman last week directed the Tennessee Valley Authority to draw up plans for increasing the power output for emergency needs. He instructed the chairman of the T.V.A. to draft a programme for additional supplies of electricity for aluminium, chemical and other defence plants.—*Reuter.*

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Lancashire Dynamo & Crypto, Ltd.—Presiding at the recent annual meeting, Mr. H. W. Bosworth (chairman), said that the parent company's works at Trafford Park and Willesden had earned satisfactory profits and they were heavily booked with orders. The Cardiff factory came into production at the end of the year. Large orders had already been received. The Wimbledon works of Foster Transformers & Switchgear, Ltd., had considerably increased its output, the transfer of Crypton Equipment, Ltd., to the new factory at Bridgwater had been completed, and the business of Crypto, Ltd., continued to expand. In spite of the difficulty of providing sufficient supplies of their own products, Lancashire Dynamo & Crypto South Africa (Pty.), Ltd., had earned a small profit.

The Telephone & General Trust, Ltd., reports a profit for 1947 of £137,705, as compared with £126,345 for 1946. The ordinary dividend for the year is 8 per cent (same) and on the "A" ordinary 8 per cent (same). Income tax requires £62,000 and £118,794 is carried forward (against £96,252 brought in).

The annual meeting will be held on 12th April. In a statement issued with the report and accounts Sir Alexander Roger (chairman), says the Anglo-Portuguese Telephone Co., has over 80,000 stations, while in Venezuela British telephone equipment is being dispatched as rapidly as it can be manufactured. Steady progress is being made by the telephone companies in Jamaica, Trinidad, Barbados and Tobago.

Hoover, Ltd.—Presiding at the recent annual meeting, Mr. C. B. Colston (chairman and managing director), said that in 1947 their exports were about eight times the 1938 figure and more than three times as much as 1946. Hoover (Electric Motors), Ltd., a wholly-owned subsidiary, was manufacturing fractional h.p. motors, the bulk of which were either exported or supplied to manufacturers in this country for equipment destined for the export market. Another subsidiary, Hoover (Washing Machines), Ltd., had commenced production and the first supplies were earmarked for export.

The Clyde Valley Electrical Power Co.—In the course of his speech at the final annual meeting held on 30th March, Dr. R. Robertson (chairman) reviewed the progress of the company since it first commenced a supply in 1905. To-day it afforded a supply over an area of nearly 1,300 sq miles to 208,000 consumers with a connected load of 780,000 kW. Throughout the whole area premises connected constituted 91 per cent of the actual premises in the area. Their associate, the Lanarkshire Hydro-Electric Power Co., was the first company in Scotland to produce electricity by water power for public supply. They still applied the same tariffs throughout the area irrespective of the distance of consumers from the generating stations and the average price received was well below 1d. per kWh notwithstanding the increase in the cost of coal over the last years. Sales of electricity in 1947 totalled 983·3 million kWh, an increase of 49·6 million kWh. The continued shortage of material had postponed many schemes of development. Satisfactory progress was being made with the installation of two generating sets at Clyde's Mill power station.

A. Reyrolle & Co., Ltd., report a trading profit for 1947, subject to audit, of £351,913, as compared with £322,054 for 1946, and a net profit, after taxation, of £129,922 (against £121,406). It is proposed to pay a dividend of 4 per cent per annum from date of allotment to 31st December last on the £800,000 redeemable preference, and a final ordinary dividend for 1947 of 7½ per cent again making 12½ per cent, less tax, for the year. The company gave an undertaking to the F.B.I. last month that for a maximum period of twelve months, it would not increase the dividend beyond what had been paid in the past.

R. B. Pullin & Co., Ltd., report a trading profit for the year ended 30th September last of £20,641, as compared with £14,352 for 1945-46, and after deducting depreciation and directors' fees there is a balance of £13,784 (against £5,711), to which is added E.P.T. repayable, £8,000, and £10,000 transferred from general reserve. After making various provisions, it is proposed to pay a dividend for the year of 10 per cent (against 12½ per cent) and to carry forward £1,552 (against £6,837 brought in).

Engineering Components, Ltd., reports a profit, subject to audit, of approximately £265,000 for 1947, as compared with £113,777 for 1946. It is proposed to pay a final ordinary dividend of 15 per cent, and a bonus of 5 per cent, maintaining the distribution for the year at 30 per cent.

The Power Securities Corporation, Ltd., reports a net profit, before tax, for 1947 of £117,253, as compared with £112,802 for 1946. The dividend for the year is unchanged at 6 per cent.

The Rheostatic Co., Ltd., reports a trading profit for the year ended 30th September last of £89,437, as compared with £64,056 for the preceding year, to which is added other income of £517. After deducting taxation, depreciation, directors' fees, etc., there is a net profit of £25,172 (against £13,493). As already announced, the ordinary dividend for the year

is 20 per cent (against 14 per cent), general reserve receives £11,500, and £5,380 is carried forward (against £5,128 brought in).

The National Gas & Oil Engine Co., Ltd., reports a trading profit of £111,786 for 1947, and a net profit of £67,267. Of this £10,000 has been placed to reserve for future taxation and £5,000 to general reserve. The ordinary dividend for the year is maintained at 5 per cent and £45,362 is carried forward (against £39,519 brought in).

The British Electric Resistance Co., Ltd., has declared an interim ordinary dividend of 5 per cent, less tax. This is the first payment since 1945 when 20 per cent, less tax, was distributed for the whole of the year.

British Electricity Stock Terms

The creation of a British Electricity 3 per cent guaranteed stock 1968-1973, to be issued at par to holders of securities of electricity undertakings, was announced by the Treasury on 1st April. The rate of interest on the new stock is the same as when the railways were taken over. In the case of the electricity stock, however, the date is 1968-1973, whereas in the case of the Transport Stock, the date was 1978-1986.

Two special issues of stock have been made by the Authority to replace stocks guaranteed by the Government under the Trade Facilities Act. One is £587,900 of 3 per cent guaranteed stock (1948-1953) in respect of the North Wales Power Co. and the other £412,400 of 5 per cent guaranteed stock (1957) issued to holders of a similar stock of the North Metropolitan Power Station Co.

The Minister of Fuel and Power last week made the Electricity (Security Values) (No. 2) Order, 1948 (S.I. 1948 No. 631, H.M. Stationery Office, price 1d.), declaring the values of a further list of securities as required by the Electricity Act. The Order refers to unquoted securities.

New Companies

Correx Communications Equipment (1948), Ltd.—Registered 22nd March. Capital, £10,000. Manufacturers of, and dealers in, electrical, mechanical and scientific apparatus and appliances, etc. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Westfields (Acton), Ltd. — Registered 9th March. Capital, £300. To acquire the business carried on by L. D. Brown, H. Eckersall and R. H. Eckersall at Acton, as " Westfields Products " and to carry on business of manufacturers of, and dealers in, electrical products of all kinds, etc. Directors: L. D. Brown and E. A. Dunn. Regd. office: 17, Westfield Road, Acton, W.3.

T. L. Whitley & Co., Ltd.—Registered 25th March. Capital, £2,000. Electrical engineers and general electrical installation contractors, etc. Directors: T. L. Whitley (permanent managing director) and B. Corbishley. Regd. office: 72, Church Street, Tunstall, Stoke-on-Trent.

A. G. & H. Cumper, Ltd.—Registered 23rd March. Capital, £5,000. To acquire the business of electrical and radio engineers carried on by H. & A. G. Cumper at Gomshall and Shere, Surrey. Directors: H. Cumper and A. G. Cumper. Secretary: Mrs. Barbara Cumper. Regd. office: 12, High View, Gomshall, Surrey.

Kem (Birmingham), Ltd.—Registered 10th March. Capital, £500. Electrical engineers and contractors, etc. C. J. Lockwood signs as director. Regd. office: 93, Highgate Road, Sparkbrook, Birmingham, 12.

Sandown Radio Instruments, Ltd.—Registered 31st March. Capital, £5,000. Designers and manufacturers of, and dealers in, electrical, radio, sound recording and television apparatus, etc. Directors: H. F. Goodenough and G. E. Tonge. Regd. office: Back Lowery Terrace, Lytham Road, Blackpool.

Liquidations

R.C.G., Ltd., manufacturers of electrical equipment, 89, Chertsey Road, Woking, Surrey.—At a creditors' meeting on 31st March a resolution was passed confirming the voluntary liquidation of the company with Mr. J. S. Bradley Hole as liquidator. A committee of inspection was also appointed.

Gourlay Electrical, Ltd.—Winding up voluntarily. Liquidator, Mr. E. S. Browne, 41, North John Street, Liverpool, 2, to whom all claims should be sent by 30th April.

Electrical Undertakings, Ltd.—The final meetings of members and creditors, pursuant to section 245 of the Companies Act, 1929, will be held at 3, Alfred Street, Leeds, 1, on 4th May, to receive a report by the liquidator, Mr. C. H. Baker.

Bankruptcies

G. H. Payton, electrical contractor, carrying on business at 157-159, King Edward Road, Ladywood, Birmingham.—Receiving order made 22nd March on debtor's petition.

First meeting 14th April at the Official Receiver's Office, Somerset House, 37, Temple Street, Birmingham. Public examination, 24th June at the Court House, Corporation Street, Birmingham, 4.

E. Ball, electrical contractor, carrying on business at Old Hall Street, Middleton, Lancs.—Application for discharge to be heard on 6th May at the County Court House, Church Lane, Oldham.

R. Jones, carrying on business at 23, Bridge Street, Bridlington, electrical, radio and refrigeration engineer.—Receiving order made 23rd March on debtor's petition.

STOCKS AND SHARES

ON the eve of the Budget, Stock Exchange markets developed a firm and healthy appearance. Substantial sums of money came in for investment into good class ordinary and preference shares. The turnover in the new British Electricity and British Transport 3 per cent issues, continues to be on a heavy scale. A difference of two points in favour of the Electricity Stock is due to its shorter term.

After starting life a week ago at a discount of 1¾ per cent, British Electricity Stock, issued at par as compensation to holders of electricity supply stocks, hardened to 98¾. In paring the terms of the stock to fit with mathematical precision the strict provisions of the Act, the Treasury made it virtually certain that stockholders would receive, at least in the early stages, something less than value for their money. A 3 per cent issue, redeemable 1968-73, left but little margin to accommodate the moderate volume of selling which was only to be expected. British Transport 3 per cents, and other securities with medium to long redemption dates, depreciated a fraction in sympathy.

Loss of Income

With the rate of interest on British Electricity Stock confirmed as 3 per cent, holders of the former electricity supply shares can now calculate the loss of income involved in the take-over. On the debentures, the loss is, generally speaking, relatively light. Both Metropolitan Electric and Newcastle 3 per cent debentures, for instance, are taken over at par, and consequently there is no loss of income. Holders of a number of the 3½ per cent issues, such as those of North Metropolitan and North Eastern Electric, receive about £102½ new stock for every £100 of the old; the income drops from £3 10s. to around £3 1s. 6d. per cent. Some of the high-interest debentures fare disproportionately badly: £100 London Power 5 per cent stock becomes less than £104½ B.E. stock and loses as much as £1 17s. 6d. per cent interest. On the same company's 3½ per cent debenture, which receives £103 new from £100 old stock, income falls by only 3s. 3d. per cent. Anomalies of this sort abound.

It is, in the main, the junior classes that lose most by the take-over. The accompanying representative examples tell the story. They show, in each case, the approximate amount of British Electricity Stock allotted per 100 former £1 shares or units, and the change in income.

100 *Pref. Shares*	*B.E. Stock*	*Income Before*	*Income After*
	£	£ s. d.	£ s. d.
Clyde Valley 8%	205	8 0 0	6 3 0
N.E. Elec. 7% ..	182	7 0 0	5 9 0
Edmundsons 6%	155	6 0 0	4 13 0
Northampton 5%	137	5 0 0	4 2 0
Met. Elec. 4½% ..	122	4 10 0	3 13 0
100 *Ord. Shares*			
Co. London ..	247	10 0 0	7 8 0
Mid. Counties ..	257	10 10 0	7 14 0
Scottish ..	231	9 0 0	6 19 0
Yorkshire ..	254	9 0 0	7 12 0
Edmundsons ..	158	6 0 0	4 15 0

Price Changes

Changes in prices that have occurred since Easter are nearly all in the upward direction. A good deal of money has been exchanged into industrial shares by holders of electricity supply issues. It is perhaps natural that investment which has been very contented with its employment in the electricity supply group, should turn to shares in companies engaged in the manufacture of electrical equipment and allied industries.

Rising Tide

General Electric at 88s. 9d., Aron at 52s. 6d. and London Electric Wire at 45s. are all 2s. 6d. better. Siemens at 35s. show a gain of 2s. 3d. and English Electrics at 50s. 9d. regained a florin of the recent decline. Murex have been a good spot at 90s. Crompton Parkinson, 28s. 6d., Henleys, 25s., C. A. Parsons, 63s. 9d., and Associated Electrical, 76s. 3d., are amongst the many shares that have risen. Cable & Wireless stock spurted to 195 before coming back to 192½. Anglo-American Telegraph deferred attracted attention from the speculative brigade, and put on two points at 19½. Marconi Marine hardened to 33s. 6d.

Reyrolle's dividend is being kept down conservatively to 12½ per cent, despite a further rise in profits. At 63s. 6d. the £1 ordinary shares yield a shilling under 4 per cent. On Vickers' 10s. units at 29s. the return is £4 6s. 2d. per cent.

"Unvalued" Securities

A number of surprises have appeared in the lists of "inactive" electricity supply stocks valued, for compensation purposes, on the basis of negotiation as opposed to that of the Stock Exchange Official Lists. These figures were settled between the stockholders' representatives and the Ministry of Fuel and Power, because the absence of recorded dealings precluded a valuation based on market prices. Some of them invite the conclusion that holders of these "unvalued stocks" are getting, by negotiation, better terms than those received in the case of the marketable stocks. Woking Electric junior issues are among the most conspicuous examples. The ordinary shares recently changed hands at 51s. 3d., but have been awarded a compensation price of 80s.; the 10 per cent preference, which were lately dealt in at 36s., are being taken over on the basis of 50s. Altrincham Electric issues are valued at prices ranging from 3s. 6d. to 12s. 6d. higher than transactions marked within the last month or two. A few stocks still remain to be valued. Among them is Central Electricity Board 3½ per cent, 1963-93.

Next Week's Events

Monday, 12th April

BRIGHTON.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "Electric Traction on the Southern Railway," by C. M. Cock.

CARDIFF.—South Wales Institute of Engineers, 5 p.m. I.E.E. Western Centre. "Neutral Earthing of Three-Phase Systems with particular reference to Large Power Stations," by J. R. Mortlock and C. M. Dobson.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Annual general meeting. Discussion on "Economics of Metering," to be opened by E. Fawssett, and discussion and demonstration on "The Influence of Frequency Response Bandwidth on the Appreciation of Electrically Reproduced Speech and Music."

Tuesday, 13th April

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. "Electrical Control of Dangerous Machinery and Processes," by W. Fordham Cooper.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Rural Electrification in Ireland," by W. F. Roe.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Discussion on "Future Trends in the Design of Receiving Aerials," to be opened by E. M. Lee.

The Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. "The Radiography of Welds," by R. F. Bishop.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "Photographic Illumination in Motion Picture Studios," by F. V. Hauser, Dr. F. S. Hawkins and W. R. Stevens.

MANCHESTER.—Engineers' Club, 6 p.m. I.E.E. North-Western Measurements Group. "Survey of Metering Practice on the British Grid System," by F. Byrne.

WIMBLEDON.—Compton Hall, 8.15 p.m. A.S.E.E. South-West London Branch. "Resistance Welding," by H. E. J. Butler.

Wednesday, 14th April

BIRMINGHAM.—I.E.E. South Midland Students' Section. Problems evening.

EDINBURGH.—North British Station Hotel, 12.30 for 1 p.m. I.E.E. Scottish Centre. Luncheon. Heriot-Watt College, 6 p.m. "The Cavity Magnetron," by Dr. H. A. H. Boot and Dr. J. T. Randall.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Transmission Section. Lecture on "Technical and Economic Aspects of the Transmission of Electrical Energy Over Long Distances," by Dr. W. Wanger.

I.E.E. London Students' Section. Visit to Permanent Way Department and Signals School. Lillie Bridge and Earl's Court depots, London Transport.

John Adam Street, Adelphi, W.C.2, 2.30 p.m. Royal Society of Arts. "District Heating," by H. S. Horsman.

MANCHESTER.—Engineers' Club, 6.45 p.m. I.E.E. North-Western Students' Section. "High Energy Particle Acceleration," by M. J. Pentz.

SOUTHPORT.—Annual conference of the Electrical Association for Women. (Continued on Thursday).

Thursday, 15th April

BIRMINGHAM.—Imperial Hotel, Temple Street. Electrodepositors' Technical Society. Annual conference. (Continued on Friday.)

James Watt Institute, 6 p.m. Institution of Mechanical Engineers. "Some Recent Developments in the Technique of Radio Valve Manufacture," by J. W. Davies, H. W. B. Gardiner and W. H. Gomm.

EXETER.—Royal Clarence Hotel, 3 p.m. I.E.E. Western Transmission Group and South-Western Sub-Centre. "Cable Terminations," by D. B. Irving.

LEICESTER.—Electricity Offices, 6.45 p.m. Leicester Electrical Society. "Automatic Control Gear," by J. M. Hollander.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Installations Section. "The Flash Tube and its Applications," by Dr. J. N. Aldington and A. J. Meadowcroft.

South-East London Technical Institute, Lewisham Way, 7.30 p.m. A.S.E.E. S.E. London Branch and S.E. London Electrical Engineering Society. Open meeting. Lecture on "Main Line Traction," by F. H. Beasant.

MANCHESTER.—Reynolds Hall, College of Technology, 6 p.m. Illuminating Engineering Society (Manchester Centre). "New Lamps—New Uses and New Lighting Techniques," by H. C. Ruff.

WORCESTER.—Recreation Club Rooms, Electricity Works, 7 p.m. E.P.E.A. Midland Technical Group. "Maintenance and Testing of Pilot Wire Protective Systems," by M. Kaufmann.

Friday, 16th April

BRISTOL.—Bristol Electric Club. Annual general meeting.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. "The Electrical Measurement of Pressure and Strain, with particular reference to the Testing of Circuit Breakers," by R. W. Wild.

Saturday, 17th April

LEEDS.—Electricity Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. "The Development of Domestic Electrical Apparatus," by G. F. Gibson.

MANCHESTER.—Engineers' Club, 2.30 p.m. E.P.E.A. Northern Meter and Instruments (Technical) Group. "Applications of Statistics to Meter and Test Department Routine," by H. Anderson.

RECENT INTRODUCTIONS

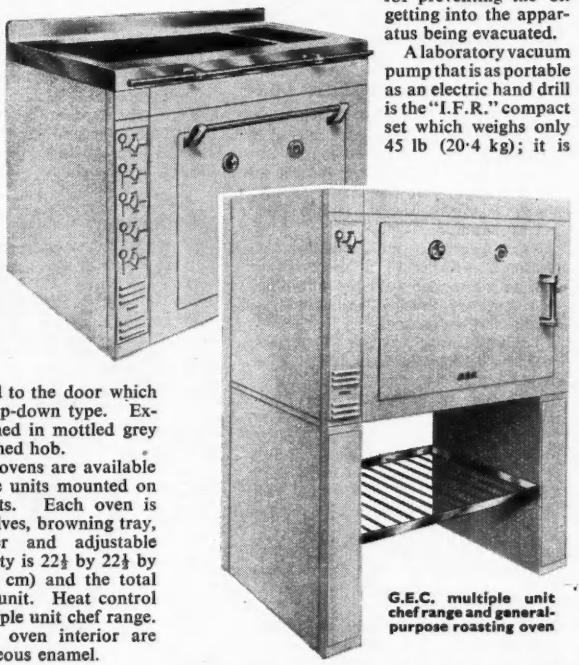
Notes on New Electrical and Allied Products

Heavy Duty Cooking Equipment

A NEW range of heavy-duty electric cooking equipment suitable for all branches of the catering industry from the smallest snack bar to the largest hotel is introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.

The multiple-unit chef range illustrated has an oven capacity of 15 by 24 by 24 in. (38·7 by 61 by 61 cm), the vitreous enamelled interior of which is fitted with one grid shelf, browning tray and full size roasting pan. There are three hotplates, one being 24 by 16 in. (61 by 40·6 cm) and the other two 8 by 6 in. (20·3 by 15·3 cm). Heat control is by means of three-heat switches with pilot lamps but an oven thermostat can be supplied if so desired. The total load is 15·9 kW. An adjustable ventilator and a thermometer are fitted to the door which is of the counter-sprung drop-down type. Externally, this cooker is finished in mottled grey vitreous enamel with a polished hob.

General-purpose roasting ovens are available in two sizes, either as single units mounted on a stand or as two-tier units. Each oven is provided with three grid shelves, browning tray, roasting pan, thermometer and adjustable ventilator. The oven capacity is 22½ by 22½ by 24 in. (57·2 by 57·2 by 61 cm) and the total load 4·8 kW for the single unit. Heat control is the same as with the multiple unit chef range. Both the exterior and the oven interior are finished in mottled grey vitreous enamel.



G.E.C. multiple unit chef range and general-purpose roasting oven

Vacuum Pumps

Under laboratory conditions where it is desirable to prevent moisture and condensable vapours from contaminating vacuum pumps drip feed oil lubrication may now be fitted to the Geryck range manufactured by the PULSOMETER ENGINEERING CO., LTD., Nine Elms Works, Reading. The oil is fed to the sealing and lubrication points from an externally mounted reservoir and, after passing through the pump, it is allowed to overflow from the delivery valve housing where it can be collected for cleaning and drying. If necessary pumps can be arranged to switch from standard circulating lubrication to drip feed at the will of the operator.

The Geryck 4 S.T.I. type, while retaining its original mechanical features, has been simplified and lightened by dispensing with oil immersion. Oil sealing is retained, but the reservoir is an integral part of the cylinder unit. For clean air circuits, continuously circulating automatic lubrication is employed with provision, in the event of the pump being shut down accidentally, for preventing the oil getting into the apparatus being evacuated.

A laboratory vacuum pump that is as portable as an electric hand drill is the "I.F.R." compact set which weighs only 45 lb (20·4 kg); it is free from vibration so may be run on the bench without being bolted down. The rotor is mounted directly on to the front flange of a ⅛-h.p., 1,450-r.p.m. motor which drives it through a built-in flexible coupling. A volume of 1 cu ft (0·02 cu m) per minute may be swept, the vacuum obtainable being 0·1 mm off perfect.

Stable Crystal Rectifiers

The belief that crystal rectifiers for communication equipment can only be obtained from the United States has been dispelled by their production by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby. Following its original development of the silicon type for centimetre-wave applications, the company is now similarly constructing a diminutive germanium type for more general use at the lower

frequencies and higher voltages, up to 80V, and better able to withstand transient overloads.

Since it is only 0·25 in. (0·63 cm) in diameter and 0·75 in. (1·90 cm) long, it can be accommodated in a fraction of the space needed for a thermionic diode, and valve heating with its attendant 50 c/s hum are avoided. The power-handling capacity is far greater, size for size, than that of a metal-oxide rectifier while superior frequency response is due to the lower capacitance of the point-contact (wire-to-crystal "cat's whisker") which is adjustable to a predetermined rectifying characteristic before being hermetically sealed into a cartridge of wire-ended form.

Distribution Fuse Box

Two types of switched distribution fuse box for installation in houses are offered by CLIFTON AIRCRAFT, LTD., Arcadia Works, Victoria Street, Lytham, Lancs. They incorporate an interlock which ensures that the mains supply is switched off before the circuit fuses can be handled.

The fusebank and switch are mounted together in a sheet metal case with knockouts on the outgoing side and are finished in a neutral shade of stone enamel.

The "Minor," which measures 10·25 by 7·25 by 2·625 in. (26 by 18·4 by 6·9 cm) incorporates a 30-A double pole main switch, four 15-A fuses and a solid neutral busbar. The "Major" has a double pole 60-A main switch, two 30-A and five 15-A fuses and measures 14·63 by 8·25 by 3·94 in. (37·1 by 21 by 10 cm). The hook-on lid, not hinged, is secured by two thumb screws.

Toy Motor

A low-voltage model motor is being marketed under the trade name of "Torch" exclusively by ALECRO (MIDDLESEX), LTD., 73, Hanworth Road, Hounslow, Middlesex. It is similar in appearance to a horizontal gas engine, being mounted on a bedplate with a large flywheel and small vee-grooved pulley for driving small models of the "Meccano" type.

It is made by Hendrey Relays, Ltd., Bath Road, Cippenham, Bucks, and is attractively finished in stove enamelled colours. It has felt feet and the smaller components are nickel-plated. The winding is designed to operate from either a 6-V battery for turning the motor over, or a 10-V transformer when it is desired to drive a small model. It is also marketed as a "kit" of parts complete with full instructions and drawings.

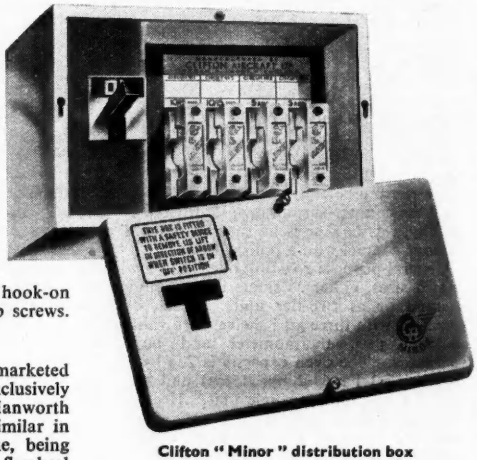
The main interest from the manufacturing point of view lies in the fact that the cylinder and driving piston comprise a small solenoid as used in many of the company's standard relays, controlled by a "make and break" driven from a cam on the crankshaft. A large number of the components are made from scrap metal, such as small sheet steel off-cuts, which would otherwise be wasted.

Perspex Tubing

Welded "Perspex" acrylic plastic tubing with a range of sizes from 0·75 in. (1·90 cm) bore upwards is now manufactured by EVOLITE PLASTICS, LTD., 325-327, Latimer Road, North Kensington, London, W.10.

Exhaust Fans

To the range of exhaust fans manufactured by DELCO-REMY-HYATT, 111, Grosvenor Road, S.W.1, have now been added 8- and 10-in. (20 and 25 cm) d.c. models. They are rated at 28 and 32 W respectively for from 100 to 250 V. The die-cast frame incorporates an oil reservoir and the sintered bearings are of the porous impregnated type surrounded by felt lubricating pads, being equally suitable for domestic drying and heating appliances or industrial extraction.



Clifton "Minor" distribution box

A single-bladed 18-in. ceiling fan driven by a shaded-pole motor is now being produced by the company and is available primarily for export.

Fluorescent Lamps

Fluorescent lamp tubes of lengths ranging from 12 to 36 in. (30·48 to 91·44 cm) and associated fittings are now being produced by SUPRA-LUX, LTD., Rodney Place, London, S.W.19. Wattages of 15, 25 and 35/40 are available for 200/250-V operation in white, sun white, warm white and peach colours. All tubes are 1½ in. (3·81 cm) in diameter, fitted with international bi-pin caps and housed in modern fittings adaptable for direct attachment to a ceiling plate or chain suspension.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

ETABLISSEMENTS, D. F.—"Movable coil supports for electrical measuring instruments." 19449. 7th July, 1938. (599247.)

1941

Purves Corporation.—"Apparatus, and systems responsive to the intensity, and direction of a magnetic field." 9715. 30th July, 1940. (599428.)

1942

Compagnie Générale de Télégraphie sans fil.—"Devices for obtaining electromagnetic fields of high-frequency and great intensity and to apparatus embodying such devices." 12053. 22nd April, 1941. (599367.)

1943

Sperry Gyroscope Co., Inc.—"Resonator wavemeter." 3537. 12th December, 1941. (599487.) "High-frequency energy transmission systems." 8448. 27th May, 1942. (599672.)

British Thomson-Houston Co., Ltd.—"Electric circuits." 13806. 25th August, 1942. (599369.) "X-ray apparatus." 17065. 22nd October, 1942. (599726.) "Continuous interrupters for electric circuits." 19065. 19th November, 1942. (599674.)

Permoflux Corporation.—"Electro-acoustic transducers." 18807. 25th November, 1942. (599790.)

Standard Telephones & Cables, Ltd., and A. J. Maddock.—"Coils for high-frequency inductive heating purposes." 19383. 19th November, 1943. (599306.)

S. Williamson.—"Delay action control device incorporating electric switches." 15062. 14th September, 1943. (599250.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Electric discharge lamps." 19339. 19th November, 1943. (599489.)

1944

Western Electric Co., Inc.—"Electron discharge apparatus." 3106. 11th October, 1941. (599253.)

G. Keinath.—"Multiple electrical recording systems." 4945. 24th December, 1942. (Addition to 581977.) (599370.)

Autophon Akt.-Ges.—"Contact device for calling dials." 8534. 21st May, 1943. (599308.)

Heating Construction, Ltd., and H. G. Darby.—"Machine for washing clothes and the like." 8970. 11th May, 1944. (599258.)

Patelhold Patentverwertungs & Elektro-Holding Akt.-Ges.—"Device for surface hardening cylindrical metallic elements of various diameters by means of high-frequency induced currents." 10159. 23rd June, 1943. (599372.)

Standard Telephones & Cables, Ltd.—"Selenium rectifier." 14014. 16th July, 1943. (599430.)

Sperry Gyroscope Co., Inc.—"Ultra-high-frequency apparatus." 17231. 18th August, 1943. (599493.) "Frequency control apparatus." 17537. 11th May, 1943. (599611.)

Marconi's Wireless Telegraph Co., Ltd.—"Electron discharge devices and associated circuits particularly for ultra-high-frequencies." 18178. 30th October, 1942. (599612.) "High-frequency radio relay stations." 18179. 16th June, 1942. (599549.)

A. H. Stevens (Electro Manganese Corporation).—"Electro-winning of manganese." 9850. 22nd May, 1944. (599796.)

Maschinenfabrik Oerlikon.—"Mercury arc rectifiers." 14895. 21st August, 1943. (599548.)

Holophane, Ltd., and S. English.—"Lighting fittings." 15830. 18th August, 1944. (599685.)

Westinghouse Electric International Co.—"Prime mover-alternator sets, and control systems therefor." 17593. 15th September, 1943. (599432.) "Speed control systems for prime movers." 17594. 15th September, 1943. (599433.)

Allmanna Svenska Elektriska Aktiebolaget.—"Means for controlling power transmissions utilizing an invertor." 20709. 30th October, 1943. (599435.)

British Mechanical Productions, Ltd., and S. T. Deakin.—"Thermionic valve-holders." 19410. 9th October, 1944. (599614.)

Sola Electric Co.—"Alternating current supply systems for gaseous discharge tubes." 22178. 13th November, 1943. (599802.)

Philco Radio & Television Corporation.—"Adjusting means for electrical transmission lines." 22701. 17th November, 1943. (599804.) "Refrigerators." 25646. 31st December, 1943. (599808.)

British Thomson-Houston Co., Ltd., and R. Pohl.—"High-frequency inductor alternators." 22871. 17th November, 1944. (599730.)

E. P Newton (Honorary Advisory Council for Scientific and Industrial Research).—"Electric resistance heating device." 24929. 12th December, 1944. (599616.) "Method of making electrically heated de-icing devices." 26031. 28th December, 1944. (599617.)

1945

C. H. Westcott.—"Electrical arrangements for connecting two sources to two loads." 788. 9th January, 1945. (599497.)

Lumalampan Aktiebolag.—"Electric discharge tubes." 2236. 12th July, 1943. (599498.) "Supply circuits for electric discharge tubes." 6650. 25th August, 1944. (599262.)

M. Tama and M. Tama.—"Removal of slag from induction furnaces." 2766. 31st December, 1943. (599439.)

Marconi's Wireless Telegraph Co., Ltd.—"Capacity switch." 3055. 27th February, 1943. (599383.) "Facsimile telegraph system and apparatus." 19670. 1st August, 1944. (599748.)

Westinghouse Electric International Co.—"X-ray apparatus." 14790. 15th June, 1944. (599273.) "Liquid-blast electric circuit interrupters." 22460. 31st August, 1944. (599318.) "Dielectric heating apparatus for the high-frequency heating of dielectric material." 24964/5/6. 28th September, 1944. (599528/9/30.) "Alternating current electric motor control systems." 4287. 9th March, 1944. (599696.) "Electrical connectors." 24225. 20th September, 1944. (599582.)

Marconi's Wireless Telegraph Co., Ltd., and P. J. Neilson.—"Electro-mechanical resonators." 15278. 15th June, 1945. (599274.)

British Thomson-Houston Co., Ltd., F. H. Clough and R. Newbound.—"Electric water heating installations." 18272. 17th July, 1945. (Cognate application 29454/45.) (599314.)

General Electric Co., Ltd., F. C. F. Phillips and A. E. Harrold.—"Manufacture of wire-wound electrical resistors." 19780. 1st August, 1945. (599316.)

A. C. Morrison (Engineers), Ltd., and A. C. Morrison.—"Means for operating electrical switchgear." 22231. 27th August, 1946. (599454.)

Venner Time Switches, Ltd., and W. F. Horgan.—"Delay action electric switching systems such as for use in aircraft fire extinguishing systems." 23801. 14th September, 1945. (599328.)

C. E. Getz, D. A. Getz, L. Ettinger, S. Ettinger, M. E. Pellman, M. J. Grosse, M. E. Grosse, M. Ettinger, B. E. Howard and H. J. Howard.—"Electric light bulb." 23813. 14th September, 1945. (599334.)

S. Jefferson.—"Electrical pulse signalling systems." 23823. 14th September, 1945. (599338.)

Standard Telephones & Cables, Ltd.—"Discriminator circuits for signal modulated electric pulses." 23831. 11th September, 1944. (599339.) "Baking by dielectric heating and apparatus therefor." 20576. 11th December, 1944. (599634.)

Western Electric Co., Inc.—"Electrical translating devices such as contact rectifiers." 23834. 24th March, 1944. (599341.)

W. Bial.—"Electric transmission system." 23894. 17th September, 1945. (Cognate application 26045/45.) (599350.)

H. S. Hughes.—"Signalling means for use in telephone systems." 2703. 21st February, 1945. (599813.)

Sulzer Freres, Soc. Anon.—"Power plants." 7394. 30th March, 1944. (599502.)

Marconi's Wireless Telegraph Co., Ltd., G. B. Banks and C. P. Fagan.—"Thermionic valves." 11154. 2nd May, 1945. (599268.)

Power Jets (Research & Development), Ltd., and A. D. Baxter.—"Axial flow compressors, turbines and the like machines." 13198. 25th May, 1945. (599391.)

British Thomson-Houston Co., Ltd.—"Indicating film cut-outs for series electric circuits." 23910. 18th September, 1944. (599353.) "Turbine bucket wheels and the like." 24086. 21st September, 1944. (599475.) "Electric blankets having safety devices." 24087. 21st September, 1944. (599476.) "Infra-red generators." 24088. 25th September, 1944. (599477.) "Holders for tubular lamps." 26873. 23rd October, 1944. (599297.) "Holders for tubular electric lamps." 31464. 25th November, 1944. (599302.)

Standard Telephones & Cables, Ltd., C. T. Daly and W. G. Flack.—"Indicators for adjustable electrical instruments." 23932. 17th September, 1945. (599355.)

South Wales Switchgear, Ltd., P. R. Davies and F. Brock.—"Electrical heating apparatus." 24084. 18th September, 1945. (599474.)

Autophon Akt.-Ges.—"Arrangement for changing-over the direction of transmission in two-way loud-speaking systems." 24109. 21st October, 1944. (599406.)

F. J. M. Theunissen.—"Automatic circuit-breakers." 24286. 23rd April, 1940. (599407.)

Maschinenfabrik Oerlikon.—"Anode lead-in arrangements for mercury vapour rectifiers." 24888. 4th November, 1944. (599507.)

Philips Lamps, Ltd.—"Devices comprising an electric gaseous discharge tube." 24901. 14th August, 1940. (599510.) "Blocking-layer rectifier cells." 24903. 29th June, 1940. (599511.) "Blocking layer cells." 24904. 3rd July, 1940. (599512.)

A. H. Stevens (Electronic Laboratories, Inc.).—"Voltage multiplying system." 24933. 26th September, 1945. (599518.)

Marshall Richards Machine Co., Ltd., and T. B. Somerville.—"Grid control of mercury vapour rectifiers." 24939. 26th September, 1945. (599519.)

G. W. Sample.—"Electro-chemical examination of solutions and liquids." 25271. 23rd January, 1945. (599409.)

S. Child and T. G. Hawkins.—"Electrical movement-transmitting systems." 25433. 1st October, 1945. (599293.)

Bendix Aviation Corporation.—"Automatically controlled demagnetizing system." 25517. 2nd September, 1944. (599294.)

R. C. Clerk.—"Electro-magnetically actuated friction clutches and brakes." 26522. 10th October, 1945. (599540.)

Singer Manufacturing Co.—"Electrostatic bonding machine." 27623. 21st June, 1945. (599298.) "Electronic bonding machine." 29872. 7th February, 1945. (599300.)

General Electric Co., Ltd., and W. F. Baker.—"Electric testing apparatus." 28590. 29th October, 1945. (599415.)

Soc. Anon. de Télécommunications.—"Equalizer for telephonic repeaters." 29589. 23rd September, 1942. (599299.)

Naamlooze Vennootschap Fabriek van Electrische Apparaten Voorheen F. Hazemeijer & Co.—"Enclosed high-tension electric switchgear." 30729. 21st July, 1942. (599301.) "Enclosed electric switchgear." 30740. 9th July, 1943. (599421.)

Westinghouse Brake & Signal Co., Ltd.—"Electric remote control systems." 11324. 10th June, 1944. (599739.)

A. Svoekhotoff.—"Apparatus for automatically sending a telephone warning to a police station, or other station." 12418. 24th July, 1944. (599705.)

Shell Development Co.—"Solvent extraction for the separation of electrolytes." 14450. 19th June, 1944. (599827.)

Power Jets (Research & Development), Ltd., and R. C. McLeod.—"Construction of turbine rotors." 14632. 8th June, 1945. (599829.)

British Broadcasting Corporation and F. J. G. Haines.—"Sound reproducing apparatus." 14786. 11th June, 1945. (599742.)

B. Lee and F. Cheverton.—"Rotary electric couplings." 15578. 19th June, 1945. (599831.)

Soc. Anon. Applications Industrielles Nouvelles.—"Elastic suspension for engines and like bodies subject to vibrations." 17235. 15th October, 1942. (599629.)

Etablissements E. Jaeger.—"Multiple electric connection devices." 17497. 20th June, 1941. (599632.)

Farnsworth Television & Radio Corporation.—"Electric supply systems." 17746. 29th May, 1944. (599633.)

J. D. McGee.—"Circuit arrangements embodying cathode-ray tubes having mosaic screens." 18589. 20th July, 1945. (599747.)

Poor & Co.—"Method of electroplating." 18971. 27th September, 1944. (599707.)

J. A. Crabtree & Co., Ltd., and R. W. Morgan.—"Electric switch sockets." 19379. 28th July, 1945. (599563.)

English Electric Co., Ltd., and H. E. Pettitt.—"Earthing reactors for a.c. networks." 21126. 18th August, 1945. (599564.)

General Electric Co., Ltd., and E. R. Thomas.—"Apparatus for measuring brightness." 21217. 20th August, 1945. (599750.)

Marconi's Wireless Telegraph Co., Ltd., A. R. Deeley and R. S. Pritchard.—"Sequentially operating electrical switching arrangement." 24156. 18th September, 1945. (599571.)

General Electric Co., Ltd., and G. Dewar.—"Electromagnetic step-by-step switches." 24183. 19th September, 1945. (599577.)

British Thomson-Houston Co., Ltd., and J. Dyson.—"Thermometric apparatus." 24189. 19th September, 1945. (599578.)

General Electric Co., Ltd., and E. H. Croft.—"Electric trolley-buses." 24243. 19th September, 1945. (599585.)

General Electric Co., Ltd., and E. W. Jackson.—"Electric switch boxes." 24244. 19th September, 1945. (599586.)

H. Lindars.—"Fluid pressure controlled electric time switching apparatus." 24245. 19th September, 1945. (599587.)

W. H. Payne.—"Mountings for electric arc furnace electrodes." 24556. 21st September, 1945. (599591.)

British Broadcasting Corporation, and G. G. Gouriet. "Measurement of the frequency of electric oscillations." 24567. 21st September, 1945. (599596.)

F. C. Orchard.—"Testing arrangements for portable electrical appliances." 24578. 21st September, 1945. (599642.)

J. B. Tucker.—"Socket holders for the ends of tubular electric lamps." 24589. 22nd September, 1945. (599645.)

M-O Valve Co., Ltd., L. R. E. Windsor and R. E. B. Wyke.—"Cathodes for electric discharge devices." 24680. 24th September, 1945. (599764.)

C. E. Every (Titanium Alloy Manufacturing Co.).—"Dielectric compositions." 24873. 25th September, 1945. (599771.)

Carborundum Co.—"Electrodes for electric arc heating." 26332. 3rd September, 1943. (599715.)

Birmingham Small Arms Co., Ltd., and C. N. Smyth.—"Means for measuring the thickness of non-magnetic coatings on magnetic bases." 26660. 12th October, 1945. (599601.)

British Thomson-Houston Co., Ltd., and B. E. G. Forsling.—"Gas turbine plant for electric ship propulsion and the like." 27749. 22nd October, 1945. (599775.)

Naamlooze Vennootschap Fabriek van Electrische Apparaten Voorheen F. Hazemeijer & Co.—"Electric switch contacts." 30727. 12th May, 1941. (599780.)

1946

Hazeltine Corporation. — "Ultra-high-frequency oscillation generator." 7736. 1st March, 1945. (599424.)

Large Air Filtration Plant

The Visco Engineering Co., Ltd., informs us that it has received a contract for a panel type viscous air filtration plant with a capacity of 3,600,000 cu ft per minute. This plant will, it is believed, be the largest air filter in the country and possibly in the world.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Offial Notices" section the date of the issue is given in parentheses.

Australia.—15th July. City Electric Ligdt Co., Brisbane. 33-kV indoor metalclah switchgear.*

Azores.—Materials for new hydro-electric power station for the Empreza de Electricidade Gas Ltda, Ponta Delgada.*

Egypt.—15th June. Ministry of Public Works. 25,000-kW power plant and auxiliaries for Talkha, North Eastern Delta.*

Glasgow.—Corporation. Supplies, including electric cable, etc., for twelve months. Specifications, etc., from Office of Public Works (Room 81), City Chambers.

Kesteven.—30th April. County Council. Electrical work at Caythorpe Court. (2nd April.)

Manchester.—15th April. No. 1 Sub-Area, North-Western Electricity Board. Cables, cut-outs and service units for twelve months from 30th June next. (2nd April.)

26th April. City Council. Electrical installations in shops, flats and garages, Baguley. (See this issue.)

Salford.—19th April. Electricity Department. Electrical installation at North Salford Secondary Modern School. (2nd April.)

Scotland.—25th May. North of Scotland Hydro-Electric Board. Construction and maintenance of the Errochty tunnel and power station, Perthshire. Particulars from Sir Alex. Gibb & Partners, 43, Northumberland Street, Edinburgh, 3 (deposit £10); tenders to be sent to the secretary of the Board, 16, Rothesay Terrace, Edinburgh, 3.

Supply, delivery and erection of about 60 miles of 132-kV wood pole transmission lines. Particulars from Merz & McLellan, 39, Northumberland Street, Edinburgh, 3 (deposit £2 2s.).

South Africa.—13th May. Johannesburg. Railways and Harbours. One 200-kVA transformer, 6,600/400/230 V, one 3-panel, 11-kV, 75-MVA switchboard, and one 6-panel, 400-V, 15-MVA switchboard. (Tender No. 7783.)*

20th May. Railways and Harbours. Telegraph line material.*

2nd June. Bloemfontein City Electricity Department. E.h.v. and h.r.c. power station switchgear.*

2nd June. Capetown Electricity Department. Metalclad service cut-outs.

30th June. Pretoria City Council. Coal-handing plant. (2nd April.)

Wiltshire.—19th May. County Council. Rewiring electrical installation in old block, and staff location and fire alarm systems at Pewsey Colony. (See this issue.)

* Specifications may be inspected at the Export Promotion Department, Thames House North, Millbank, S.W.1.

Orders Placed

Ilford.—Corporation. Accepted. Storage battery for Clark's Road primary substation (£898).—Pritchett & Gold & E.P.S. Co.

Manchester.—Electricity Committee. Accepted. Annual contracts:—Cookers.—Revo Electric Co., Simplex Electric Co., and English Electric Co. Boiling plates for cookers.—G.E.C. and English Electric Co. Washboilers.—Burco.

Todmorden.—Recommended. Eleven transformers (£3,014).—Yorkshire Electric Transformer Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldridge.—Houses (38); T. H. Partridge, clerk to U.D.C., Aldridge, near Walsall.

Ayr.—Houses (200) at Cumnock; county architect, Ayr.

Barking.—Rebuilding factory, Highbridge Road, Town Quay; Allum & Curtis, salvage contractors, Leytonstone.

Blackburn.—Works, off Preston Old Road; Scarpa Dryers, Ltd., Witton, Blackburn.

Bridlington.—Factory, Bessingby Road Industrial estate; Yorkshire Yacht & Engineering Co., Havelock Place.

Brighton.—Schools, Woodingdean (£73,000), and Sheepcote Valley (£420,000); P. Billington, schools architect, King's Road.

Burnley.—Engineering workshops, Trafalgar Street and Dent Row, for the Postmaster-General; Ministry of Works, Abell House, John Islip Street, S.W.1.

Cardiff.—Factory and showrooms, Newport Road, for William Lewis (Agricultural House), Ltd.; Howard Williams & Partners, architects, St. Andrew's Place, Cardiff.

Croydon.—Houses, New Addington (82) and Heathfield estate (22); borough engineer, Town Hall.

East Ham.—Rebuilding shops and flats, 738-744, Romford Road; A. R. Upsdale, architect, 734, Romford Road, Manor Park.

Eccles.—Houses (44), Peel Green Road and Swanage Road; borough engineer, Town Hall.

Highworth.—Houses (44), Green Road, Upper Stratton, for R.D.C.; surveyor, 17, Bath Road, Swindon.

Hull.—Reconstruction of wards, Beverley Road Institution; city architect.

Kingston-on-Thames.—Technical college (£75,000); J. Harrison, Surrey county architect, County Hall, Kingston.

Leeds.—Day nurseries, Harehills Lane and Holbeck Moor; city architect, Priestley House, Quarry Hill, 9.

Liverpool.—Primary school, Speke, for St. Christopher's church; J. C. Prestwich & Son, architects, Bradshawgate Chambers, Leigh, Lancs.

London.—BRIXTON.—Adaptations at premises, Barrington Road, for the Brixton School of Building (£29,220); L.C.C. architect, County Hall, Westminster Bridge, S.E.1.

HAMPSTEAD.—Flats (80), West End Lane; E. B. Glanfield, architect, 6, Raymond Buildings, W.C.1

SHOREDITCH.—Seven-storey block of 42 flats, Murray Grove; borough architect, Shoreditch Town Hall, Old Street, E.C.1.

SOUTHWARK.—Rebuilding paper printing works of Metal Box Co., Ltd.; S. N. Cooke & Partners, architects, Sun Buildings, Bennetts Hill, Birmingham.

Luton.—Extensions to Luton and Dunstable Hospital (£30,000); S. C. Parrott, architect, 45, Oakley Road, Luton.

Further section of Technical College; S. C. Jury, architect, Shire Hall, Bedford.

Macclesfield.—Factory, Hope Street, Adlington; English Ceramic Co., Ltd., Co-operative Street, Heaton Norris, Stockport.

Maghull.—Grammar school; G. Noel Hill, county architect, County Offices, Preston.

Manchester.—Extensions to motor body building works, Water Street, for Star Bodies, Ltd.; Major R. Bull, architect, 73, High Street, Cheadle, Ches.

Laboratories for Royal Infirmary, Oxford Road; Thomas Worthington & Sons, architects, 178, Oxford Road.

Extensions to works, Star Process Engraving Co., Ltd., Longley Lane, Northenden; Newton, Leach & Booker, architects, 28, Kennedy Street.

Moreton.—Schools, Upton Road, for Rev. P. E. Rees, Church of the Sacred Heart; W. Ellis & Son, architects, Barclay Bank Chambers, St. Helens, Lancs.

Newport (Mon.).—Dry-cleaning factory, Fairfax Road; Willmott & Robertson, architects, 51, Charles Street, Cardiff.

Norfolk.—Block of classrooms, Sidestrand Hall; education architect, County Education Offices, Stracey Road, Norwich.

Nottingham.—Reconstruction and extension scheme at Hospital for Women, Peel Street; Bromley & Cartwright, architects, 6, Clarendon Street.

Omnibus garage, Bilborough; R. M. Finch, city engineer, Guildhall.

Houses (50), Bilborough estate; C. A. Pilkington, city housing architect, Guildhall.

Oldham.—Large extensions, Castle Iron Works, for Buckley & Taylor, Ltd.; Squire Ashton & Sons, Ltd., builders, Cheapside.

Ormskirk.—Extensions to works, Blaguegate Lane; Lathom Engineering Co., Ltd.

Houses, Scarisbrick and Carr Cross sites (40), and Riding Lane, Haskayne (88), for West Lancashire R.D.C.; A. G. Crawford, surveyor, Council Offices, Derby Street.

Perthshire.—Police stations at Braco and Birnam; I. A. Moodie, county architect, Perth.

Plymouth.—Factory, Laira Bridge Road, for the Slumberland Mattress Co., Acocks Green, Birmingham; H. J. Hammick, architect, 21, Alma Road, Pennycomequick, Plymouth.

Reading.—Reconstruction of signal works and stores, Caversham Road; Railway Executive, Western Division, Paddington.

Rotherham.—Junior, infants' and nursery schools, Blackburn site; E. J. Manson, borough engineer, Municipal Buildings.

Salford.—Housing estate, Radford Street and Blackfield Lane; T. A. Fitton & Son, architects, 7, Chapel Walks, Manchester.

Rebuilding works, Lower Broughton Road; J. Lee & Co. (Leeprufe), Ltd., East Stanley Street, Manchester.

Sheffield.—Omnibus garage, with workshops, boiler houses, offices, etc., Herries Road; W. G. Davies, city architect, Town Hall.

Southend-on-Sea.—Factory and offices, Oakhurst Road, Prittlewell, for Seaforth Engineering Co., Ltd.; H. P Liberty, architect, Western Road.

Steyning. — Secondary modern school (£114,000); F. R. Steele, county architect, West Sussex County Hall, Chichester.

Surbiton.—Factory, Roebuck Road, for Partridge Transformers, Ltd., 76, Petty France, S.W.1.; G. Coles, architect, 40, Craven Street, W.C.2.

Ulverston.—Special residential school for 81 children at Stone Cross; C. E. Pearson, architect, 18, Dalton Square, Lancaster.

Wakefield.—Primary school, Flanshaw estate; E. H. Staziker, city engineer, Town Hall.

Walsall.—Tube drawing and welding department, off Green Street and Miner Street; Barton Conduits, Ltd.

Warrington.—Houses (400), for R.D.C.; S. C. Oxley, surveyor, Council Offices, 4, Museum Street.

Wigan.—Houses (32), Norley Hall; D. M. McKellen, borough engineer, Library Street.